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ABSTRACT

This market research report analyzed the published literature, the size of the deaf/severely hard-of-hearing population, factors that affect demand for closed-captioned television decoders, and the supply of decoders. The analysis found that the number of hearing-impaired people in the United States is between 16 and 21 million; hearing impairment is more prevalent with older and lower income people. The size of the market for decoders is considered to be approximately one million. Sales of decoders, about 208,000 from 1980 through 1988, were affected by the following factors: level of consumer knowledge, reliance on residual hearing and lipreading, cost, and influence of family members. The report concluded that various actions could influence decoder purchase and possibly expand the market for decoders, such as expanding the knowledge of decoders through a public awareness campaign and having the National Captioning Institute incorporate innovations in decoder technology. Various government agencies are encouraged to undertake additional research on degree of hearing loss and on the use of closed-captioned decoders as instructional tools for the hearing impaired, learning disabled, people with limited English speaking ability, and the adult beginning reader. (JDD)

ANALYSIS OF DEMAND FOR DECODERS OF TELEVISION CAPTIONING FOR DEAF AND HEARING-IMPAIRED CHILDREN AND ADULTS

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EXECUTIVE SUMMARY

Over the last 40 years television has become an integral part of the American culture. The more than 1,000 television stations, excluding cable television, provide a major source of information and entertainment to the American public. However, for the hearing impaired, few benefits can be derived from a cultural phenomenon based on audio comprehension.

Concern about the lack of comprehension of audio-visual media by the deaf was acknowledged in 1958 with the enactment of P.L. 84-905, a law which established the Captioned Films for the Deaf Program as part of the U.S. Office of Education. Initially created to provide subtitled Hollywood films for the deaf, program authority was soon expanded to include the design and distribution of educational materials and media equipment for deaf students. Program authority was further expanded and, in the fall of 1972, the Department of Health, Education and Welfare (HEW) began funding research through the Public Broadcasting Service (PBS) to develop a system of closed-captioned television programs.

Today, the Media Services and Captioned Films Program in the Office of Special Education Programs supports a variety of activities to provide closed-captioned television to the hearing-impaired population. These activities include the captioning of television programs and subsidies for the production of closed-captioned decoders. Captions are subtitles that enable hearing-impaired viewers to read what they cannot hear in the television transmission. Closed captions are captions that are part of the television signal that appear only

on television sets adapted with a special device called a decoder that is either connected to a television receiver or built into the receiver itself. The decoder translates part of a television signal into a printed line of text that is then shown on the television screen.

Estimates of the hearing-impaired population based on the 1986 National Health Interview Survey (NHIS) indicate that there are about 21 million people in the United States, of whom about 1.6 million people are estimated to be deaf. However, sales of the closed-captioned decoder represent only a small fraction of all potential users. The large discrepancy between the market for the decoder and the number of sales, coupled with the investment of the Federal Government in supporting decoder development and subsidizing decoder production, led the Office of Planning, Budget and Evaluation (OPBE) in the U.S. Department of Education (ED) to conduct a study of the market for closed-captioned decoders among deaf and hard-of-hearing children and adults.

The specific purpose of the market analysis was to address the following research questions:

- What is the size of the deaf and hard-of-hearing population which could potentially use decoders?
- How aware are hearing-impaired people of decoders?
- What factors affect the demand for decoders?
- What is the current supply of decoders?
- What is the technology of decoders?

To address the research questions in this study, four major activities were undertaken. First, a literature review was conducted to provide background information on: the prevalence of hearing impairment in the U.S. and the trends in prevalence rates among the hearing-impaired population; characteristics of television decoder owners and non-owners; television viewing patterns of the hearing impaired; amount of closed-captioned programming available; and potential factors limiting penetration of the decoder market.

Second, data from the 1986 NHIS conducted by the National Center for Health Statistics (NCH were reanalyzed to attempt to determine the size of the deaf and severely hard-of-hearing populations. Third, focus groups were conducted to investigate the factors that affect demand for decoders among this population. And finally, interviews with the staff at the National Captioning Institute, program staff at the Department of Education, and representatives of other organizations were conducted to obtain information about the supply of

closed-captioned decoders. The major findings of this research are presented below.

The Potential Market for Closed-Captioned Decoders

Total Prevalence

Several studies estimate the number of hearing-impaired people in the United States. Although these studies define the hearing-impaired population in different ways and use different methodologies to estimate the size of this population, they suggest the following conclusions about the prevalence of hearing impairments in the U.S. population.

- **THE NUMBER OF HEARING-IMPAIRED PEOPLE IN THE UNITED STATES IS BETWEEN 16 AND 21 MILLION. THIS INCLUDES PEOPLE WHO ARE MILDLY TO SEVERELY HARD-OF-HEARING OR WHO ARE DEAF IN ONE OR BOTH EARS. THE NUMBER OF PEOPLE WHO ARE DEAF IN BOTH EARS IS BETWEEN 292,000 AND 1.6 MILLION. IT IS NOT CURRENTLY POSSIBLE TO IDENTIFY THE NUMBER OF HARD-OF-HEARING PERSONS WHO ARE SEVERELY HARD-OF-HEARING.**

Two estimates from the NHIS provide the boundaries for the size of the hearing-impaired population. The 1977 NHIS estimated that 16.2 million people had some difficulty hearing, of whom about 7.3 million aged three and over had a bilateral hearing loss (in both ears), including deafness. In addition, a supplemental self-evaluation scale was included in the 1977 NHIS which estimated the deaf population at 292,000. This number probably represents persons who perceive themselves as totally deaf. The 1986 NHIS estimated that there were approximately 21 million people who were hearing impaired, of whom 1.6 million were deaf. While the survey differentiated deafness from hearing impairment, it did not differentiate the severity of people's hearing impairments.

Effects of Age on Prevalence

Although people in all age groups in the population suffer from hearing impairments, the prevalence of these impairments is not consistent throughout the population. Studies of the hearing-impaired population demonstrate consistently that:

- **THE PREVALENCE OF HEARING IMPAIRMENTS IN THE POPULATION RISES DRAMATICALLY WITH AGE. IN 1986, THE PREVALENCE RATE OF 295.6 PER 1000 POPULATION FOR PEOPLE OVER 64 YEARS OF AGE WAS NEARLY 15 TIMES HIGHER THAN THE PREVALENCE RATE FOR PEOPLE UNDER 17 YEARS OF AGE.**

It was estimated in 1986 that of the nearly 21 million people with hearing impairments, about 8.1 million -- or about 39 percent of the total -- were people aged 65 and over. In contrast, people under 18 represented only about 6 percent of people with hearing impairments, people aged 18 to 44 about 25 percent of the population, and people aged 45 to 64 about 29 percent of the hearing-impaired population.

Effects of Income on Prevalence

In addition to differences in the prevalence of hearing impairments in different age groups, there also appears to be a relationship between hearing impairment and income. National surveys of hearing impairment show that:

- **PERSONS WITH LOWER INCOME, THROUGH AGE 74, ARE MORE LIKELY TO BE HEARING IMPAIRED THAN PEOPLE IN HIGHER INCOME CATEGORIES.**

- **REGARDLESS OF INCOME, THE PREVALENCE OF HEARING IMPAIRMENT INCREASES WITH AGE.**

Although reasons for the relationship between low family income and a higher rate of hearing impairment for people under 75 years of age are not known, it could be attributed to the fact that lower-income groups have poorer general health, poor primary health care, and greater exposure to environmental noise. The reverse in the prevalence of hearing impairments in the oldest group in the population may be due to the fact that people with higher incomes may live longer than their poorer contemporaries.

While estimates of the hearing-impaired population range from about 16 to 21 million people, the market for closed-captioned decoders may be smaller than either of these figures, since the hearing-impaired population includes people who, for a variety of reasons, may be unable to benefit from decoders.

Size of the Market for Decoders

This study attempted to refine the estimates of the market for closed-captioned decoders to include only people who could benefit from the decoder, based on a reanalysis of the 1986 NHIS. The analysis attempted to differentiate people who were mildly hearing impaired from those who were severely hearing impaired. It is generally agreed that many severely hearing-impaired persons can benefit from closed-captioned television and should be a prime market for decoders. However, the 1986 NHIS does not include questions that allow differentiation of the levels of hearing impairment among the bilaterally hearing impaired. This lack of data precludes the development of estimates of the market for decoders in the severely hearing-impaired population. The

analysis is limited therefore and only estimates the market for decoders in the deaf population.

The analysis finds that:

- **THE MAXIMUM MARKET FOR CLOSED-CAPTIONED DECODERS IN THE DEAF POPULATION IS 1.58 MILLION.**

- **ELIMINATING FROM THE MARKET PEOPLE WITH VISUAL IMPAIRMENTS REDUCES THE NUMBER OF POTENTIAL USERS OF DECODERS FROM 1.58 MILLION TO BETWEEN 1.45 AND 1.56 MILLION.**

- **ELIMINATING PEOPLE UNDER FIVE WHO MAY BE TOO YOUNG TO READ THE CAPTIONS AND PEOPLE WITH LOW LEVELS OF EDUCATIONAL ATTAINMENT WHO MAY NOT READ WELL ENOUGH TO BENEFIT FROM CAPTIONING REDUCES THE NUMBER OF POTENTIAL DEAF USERS TO BETWEEN 959,000 AND 1.03 MILLION.**

Factors Affecting the Demand for Closed-Captioned Decoders

Conduct of Focus Groups

To estimate the demand for closed-captioned decoders, focus groups were conducted with a sample of owners and non-owners from three groups in the Washington metropolitan area: the deaf; the severely hard-of-hearing; and parents of deaf and severely hard-of-hearing children. The focus groups were designed to explore the factors that influenced the decisions of decoder owners to purchase the decoder and factors that may have deterred non-owners from making such a purchase. It must be noted that the focus group participants, by virtue of living in the Washington area, with its many resources for the deaf and severely hard-of-hearing, may not be representative of this population nationwide and may well be more knowledgeable about assistive devices than individuals living in other parts of the country. In other respects, Washington area residents should reflect the same concerns as hearing-impaired persons or parents of hearing-impaired persons anywhere.

Factors Affecting the Decision to Purchase and Use a Decoder

Discussions in the focus groups revealed that:

- **THE HEARING-IMPAIRED POPULATION LACKS INFORMATION ON THE CAPABILITIES OF DECODERS, THEIR PRICE, AND THEIR PLACE OF PURCHASE. THIS LACK OF KNOWLEDGE APPEARS TO BE A MAJOR DETERRENT TO THE PURCHASE OF A DECODER.**

Knowledge about closed-captioned decoders does not appear to be as widespread in the deaf and hard-of-hearing communities as

would be expected. Many participants in the focus groups were uninformed about captioning and decoders, and many who knew about the decoder lacked adequate information about price and place of purchase to make a decision to purchase the product.

- **MANY HARD-OF-HEARING PEOPLE BELIEVE THEIR HEARING HAS NOT DETERIORATED SUFFICIENTLY TO WARRANT THE PURCHASE OF A DECODER. BOTH THE DEAF AND HARD-OF-HEARING RELY ON THEIR RESIDUAL HEARING AND ON LIPREADING TO ENHANCE THEIR UNDERSTANDING OF TELEVISION.**

The perception that the degree of hearing loss is not great enough to warrant the purchase of a decoder appears to be a major deterrent to the purchase of the product by potential users. This perception, coupled with the use of alternative assistive listening devices such as audio loops and FM listening devices, may help account for the fact that a relatively small proportion of the market for decoders has been tapped -- at least among the hard-of-hearing.

- **THE COST OF DECODERS APPEARS TO ACT AS A DETERRENT TO PURCHASE BY HARD-OF-HEARING PEOPLE -- PARTICULARLY PEOPLE WHO DO NOT PERCEIVE THEIR HEARING LOSS TO BE ESPECIALLY SEVERE. DEAF PEOPLE FROM LOW-INCOME BACKGROUNDS ALSO INDICATE THAT THE COST OF THE DECODER ACTS AS A DETERRENT TO PURCHASE.**

The focus groups produced a variety of opinions about the cost of the decoder, including the view among some decoder owners that the current price of the TeleCaption 3000 at $180 was reasonable or low.

The price of decoders may be a significant deterrent to purchase in two key segments of the population: the hard-of-hearing who still rely on residual hearing to watch television and the low-income deaf. Although generally regarded as "reasonable" by parents of hearing-impaired children, the price of $180 also appears to act as a deterrent to the purchase of a second decoder by people who already own a decoder. It is not clear, however, from the focus groups what price would be more acceptable to people who were reluctant to purchase a decoder, nor how much different decreases in price would affect the demand for the product.

- **FAMILY MEMBERS PLAY A MAJOR ROLE IN INFLUENCING THE PURCHASE OF DECODERS AMONG THE HARD-OF-HEARING. THIS ROLE APPEARS LESS IMPORTANT IN THE DEAF POPULATION WHO ARE MORE WILLING TO SEEK AND USE DECODERS.**

The focus groups suggest that while it is important for hearing-impaired people to be aware of decoders in order to be able to purchase the product themselves, relatives of the population are also an appropriate audience for marketing efforts --

particularly for the hard-of-hearing population. Hearing relatives are often more perceptive about the need for a decoder than the hearing-impaired person and willing to purchase the decoder as a gift for a family member with a hearing impairment.

- **IMPROVEMENTS IN DECODER TECHNOLOGY MAY INFLUENCE THE DECISION OF CURRENT OWNERS TO PURCHASE A SECOND DECODER, BUT ARE A MUCH LESS IMPORTANT FACTOR IN THE DECISION OF NON-OWNERS TO PURCHASE A FIRST DECODER.**

While decoder technology -- or improvements in the technology -- may not be the key factor influencing people's decisions to purchase -- or not to purchase -- a decoder, some changes in the technology appear to be of interest to current owners or to potential buyers. Simplifying the instructions for installation was favored by most respondents in the focus groups, but other features such as a decoder built into the television produced mixed reactions. Some respondents favored this type of technological change, while others thought that problems in repairing a unit with all features built in would offset the advantages of this decoder feature.

Sales of Closed-Captioned Decoders

Closed-captioned decoders have been marketed commercially since 1980. However, a review of sales records for the decoder indicates that the number of decoders sold represents only a small fraction of the potential market for the product. The following points about decoder sales emerged from analysis of these sales records.

- **IN THE PERIOD FROM 1980 THROUGH 1988, ABOUT 208,000 CLOSED-CAPTIONED DECODERS WERE SOLD. THIS FIGURE IS WELL BELOW THE INITIAL PROJECTIONS OF 100,000 SALES PER YEAR.**

- **THE INTRODUCTION OF EACH NEW GENERATION OF DECODER HAS GENERALLY BEEN FOLLOWED BY A BURST IN SALES, WITH A DROP IN SALES TO LOWER LEVELS AFTER A FEW MONTHS.**

Based on analysis of sales records, it appears that a total of about 208,000 decoders were sold between 1980, when the first-generation decoder, TeleCaption I, was first introduced in 1980, and September 1988. These figures include 100,000 sales of the TeleCaption I between 1980 and mid-1985, about 80,000 sales of the TeleCaption II between January 1986 and October 1988, and about 28,000 sales of the TeleCaption 3000, between June and October 1988.

The introduction of each new generation of decoders has been followed by an initial burst in sales, but then sales have

leveled off after the new model has been on the market for a short time. Additional marketing efforts in the hearing-impaired community -- or the expansion of the market to other segments of the population -- may be required if higher levels of decoder sales are going to be sustained over a longer period of time.

Conclusions

The research conducted in this study produced several significant findings about the demand for closed-captioned television decoders. Certain actions will affect the purchase of decoders and possibly increase their use by deaf and hard-of-hearing people. Additional research is needed in several areas, however, to improve knowledge of the market for decoders. Study conclusions are presented below.

Activities to Influence Decoder Purchase

The focus groups identified several factors that appear to influence decisions about the purchase of a decoder. A number of factors, including lack of knowledge about decoders, acted as deterrents to decoder purchase. Based on these findings, the following actions could influence decoder purchase and possibly expand the market for decoders.

1. **EXPAND KNOWLEDGE OF DECODERS THROUGH A PUBLIC AWARENESS CAMPAIGN.**

The hearing-impaired population in the Washington area lacks knowledge about the capabilities of decoders, their cost, and their place of purchase. Moreover, lack of knowledge may be even more prevalent among the hearing impaired in other parts of the country, given the relative sophistication of the deaf community in the Washington area. Publicizing decoders through written materials alone, however, may not be effective because of the marginal literacy skills of many members of this population.

Teachers and related services personnel who provide services to deaf students should provide more information about decoders to children and their parents. At present, only professionals in schools for the deaf seem to be making sure that parents know about the availability of decoders.

Reaching the adult deaf audience may require a public-awareness campaign that includes a variety of components, including "hands-on" demonstrations in the local community. Promotional campaigns should include relatives of the hearing impaired as targets. Family members frequently purchase decoders as gifts for their hearing-impaired relatives and may be more perceptive than their

hard-of-hearing relatives of the utility of the device. These promotional activities could be conducted -- or supported -- by the Department of Education, the National Captioning Institute, the television networks as a public service, as well as by organizations serving the deaf and hearing-impaired communities.

2. **THE NATIONAL CAPTIONING INSTITUTE SHOULD CONSIDER MODIFICATIONS IN DECODER TECHNOLOGY THAT INCORPORATE RECOMMENDED INNOVATIONS.**

The focus group discussions indicated that several technological improvements may influence the decision of current decoder owners to purchase a second decoder. These include an integrated system which would be relatively compact and easy to operate, simplifying decoder hook-up, and developing a portable unit that could be used for travel. In addition, diversifying the decoder to include a basic model and a model with "luxury" features would appeal to a larger segment of the hearing-impaired population.

Research Activities

Although this study provided a great deal of information about the demand for closed-captioned decoders, it is essential that various government agencies undertake additional data collection activities to gather more accurate and current information on this issue.

3. **THE NATIONAL CENTER FOR HEALTH STATISTICS SHOULD COLLECT DATA ON THE HEARING IMPAIRED THAT PROVIDES INFORMATION ON THE DEGREE OF HEARING LOSS.**

While there are several sources for estimating the prevalence of hearing impairment in the United States, no recent surveys provide data on the degree of hearing loss. Analyses of the 1986 NHIS provided a broad estimate of bilateral hearing impairment, but it was not possible to identify the portion of this population who are severely impaired and who would require special services and assistive devices. NCHS should include the Gallaudet Hearing Scale in the 1991 NHIS. This supplemental questionnaire, included in the 1971 and 1977 NHIS, provides information on levels of hearing impairment based on respondents' self evaluation of their ability to hear and understand speech through the ear alone.

4. **THE OFFICE OF SPECIAL EDUCATION AND REHABILITATIVE SERVICES (OSERS) SHOULD CONDUCT RESEARCH STUDIES ON THE USE OF CLOSED-CAPTIONED DECODERS AS INSTRUCTIONAL TOOLS IN DEVELOPING READING SKILLS AMONG THE HEARING IMPAIRED.**

The reading levels of hearing-impaired students are well below the levels of the average child. However, there is only limited research on the effects of captioning on the development of

reading skills in this popul[illegible] OSERS should provide research support to institutions wit[illegible] researchers with expertise working with the hearing-ir[illegible] population to study this area. Such research should focus on the development of sight vocabulary, reading comprehension, and verbal learning. If the studies prove that decoders have a beneficial effect on a child's ability to read, they could serve as an incentive for parents and relatives of the hearing impaired to make the purchase of a decoder a priority.

5. **THE DEPARTMENT OF EDUCATION SHOULD CONDUCT RESEARCH ON THE USE OF DECODERS AS INSTRUCTIONAL TOOLS FOR THE LEARNING DISABLED, PEOPLE WITH LIMITED PROFICIENCY IN ENGLISH, AND THE ADULT BEGINNING READER.**

There are several other target populations that could benefit potentially from the use of the decoder if it proved to be an effective learning tool. These groups include the learning disabled, people with limited proficiency in English, and the adult beginning reader. However, there is currently little or no research that examines the effectiveness of the decoder as an instructional tool for these populations. OSERS, the Office of Bilingual Education and Minority Language Affairs (OBEMLA), and the Office of Adult and Vocational Education (OVAE) should support research -- either independently or jointly -- that examines the effectiveness of decoders as an instructional tool for each of these populations. Again, should the research show that decoders enhance the reading ability of these populations, it could expand the market for decoders significantly.

6. **THE DEPARTMENT OF EDUCATION SHOULD CONDUCT FOCUS GROUPS IN DIFFERENT REGIONS OF THE COUNTRY TO VALIDATE THE FINDINGS OF THE FOCUS GROUPS HELD IN THE WASHINGTON METROPOLITAN AREA.**

A consensus among members of the deaf community in the focus groups and among consultants to the study was that Washington may not be representative of the deaf community in many ways. The presence of Gallaudet University and the headquarters of several organizations representing the deaf may produce a more sophisticated and knowledgeable community. Information provided by these focus groups should be supplemented with information from a more representative population. Small focus groups should be held in other parts of the country to validate the findings developed from the focus groups conducted in the Washington area.

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CHAPTER I: INTRODUCTION

Over the last 40 years television has become an integral part of the American culture. The more than 1,000 television stations, excluding cable television, provide a major source of information and entertainment to the American public. However, for the hearing impaired, few benefits can be derived from a cultural phenomenon based on audio-comprehension.

Concern about the lack of comprehension of audio-visual media by the deaf was acknowledged in 1958 with the enactment of P.L. 84-905, a law which established the Captioned Films for the Deaf Program as part of the U.S. Office of Education. Initially created to provide subtitled Hollywood films for the deaf, program authority was soon expanded to include the design and distribution of educational materials and media equipment for deaf students. Program authority was further expanded and, in the fall of 1972, the Department of Health, Education and Welfare (HEW) began funding research through the Public Broadcasting Service (PBS) to develop a system of closed-captioned television programs.

PBS began developing and testing a closed-captioned system that had been developed initially by the National Bureau of Standards. Within two years, PBS was ready to field test the prototype decoder. In 1974, the Federal Communications Commission (FCC) granted temporary authority to field test the system at selected PBS stations nationwide. Permanent authority to transmit closed captions would rest on several issues: audience reaction to captions; cost of captioning; and manufacture and distribution of equipment.

Favorable responses to captioning from the hearing-impaired population and assurances that the per hour cost of captioning would be reasonable resulted in permanent approval in 1976 to broadcast captions. The supply of captions for network programs at a low cost would be accomplished through the creation of a non-profit captioning institute. This resulted in the creation of the National Captioning Institute in 1979, with start-up funds provided by the Federal Government.

Today, the Media Services and Captioned Films Program in the Office of Special Education Programs supports a variety of activities to provide closed-captioned television to the hearing-impaired population. Funds appropriated by Congress are used to:

- o Continue research designed to reduce decoder costs;
- o Subsidize decoder production;
- o Caption television programs with specific emphasis on children's programs; and
- o Develop public awareness campaigns to alert the public and the hard of hearing about the service.

Many of these activities are carried out as a result of requests for proposals issued by the program under its statutory authority.

Closed Captioning and Decoder Equipment

Captions are subtitles that enable hearing-impaired viewers to read what they cannot hear and to participate in the educational and entertainment experiences of television (Koskinen, Wilson and Jensema, 1985). Closed captions are captions that are part of the television signal that appear only on television sets adapted with a special device called a decoder that is either connected to a television receiver or built into the receiver itself. The decoder translates part of a television signal into a printed line of text that is then shown on the television screen.

A television picture consists of 525 lines flashing on the screen, not all of which are used as part of the regular picture. The unused or blank lines, known as Vertical Blanking Intervals (VBI) appear as a black bar seen on the television receiver when it needs adjustment. These blank lines are used to transmit information. Line 21, the last line in the VBI before the actual picture begins, is used for encoding captions. A program's dialogue is encoded on a magnetic disk and electronically inserted into the television program and transmitted along with the regular audio and visual signals. The decoder translates the Line 21 signals and generates the visible characters on the screen, enabling the hearing impaired to read the program's dialogue. The size of the characters depends on the size of the television screen. The viewer uses the decoder to control the display or removal of the captions.

During the late 1970s, Texas Instruments and the Sanyo Corporation began the design and manufacture of the built-in decoder for home television sets and the self-contained adapter units. Closed-caption decoders became commercially available in 1980. Marketed under the brand name TeleCaption, decoders were available initially through Sears, Roebuck and Company catalogue sales. Today distribution has been expanded to include a variety of retail and specialty stores such as Erol's Video Stores,

Service Merchandise and J.C. Penney, and organizations within the hearing-impaired community such as the National Association of the Deaf (members only) and Telecommunications for the Deaf, Inc. (TDI).

The Market for Closed-Captioned Decoders

Closed-captioned decoders were developed to enhance television viewing among the deaf and hard-of-hearing population. Estimates of this population range from about 16.2 million to 21 million persons; estimates of the deaf population alone range from 292,000 to about 1.6 million. Estimates vary largely due to differences in definition of hearing impairment and differences in the methodology used to estimate the size of this population.

Although the potential market for closed-captioned decoders is estimated to be several million people, the number of decoders sold represents only a small fraction of that number. It is estimated that approximately 208,000 closed-captioned decoders have been sold since their introduction on the market in March 1980. These include 100,000 first-generation decoders, TeleCaption I, which were on the market from March 1980 through mid-1985, about 80,000 TeleCaption IIs, which were introduced in January 1986, and 28,000 TeleCaption 3000s, which became available in June 1988. Although there appears to be a burst of sales when a new generation of closed-captioned decoder is introduced on the market, there still remains a large disparity between the number of hearing-impaired individuals who could benefit from a decoder and the number of decoders purchased.

Purpose of the Study

Decoder sales represent only a small fraction of the estimated number of hearing-impaired persons in the United States. This large discrepancy, coupled with the investment of the Federal Government in supporting decoder development and subsidizing decoder production, led the Office of Planning, Budget and Evaluation (OPBE) in the U.S. Department of Education (ED) to conduct a study of the market for closed-captioned decoders among deaf and hard-of-hearing children and adults. The market analysis was developed around the following research questions:

- What is the size of the deaf and hard-of-hearing population which could potentially use decoders?
- How aware are hearing-impaired persons of decoders?
- What factors affect the demand for decoders?

- What is the current supply of decoders?
- What is the technology of decoders?

Prior to actual analysis, several hypotheses were developed to explain the discrepancy between the potential market for decoders and the actual decoder sales. The study attempted to explore each of the following hypotheses.

- The actual market for decoder users is smaller than the national estimates of the hearing-impaired population.
- The target population for potential decoder purchasers is too narrowly defined.
- There are specific characteristics or attitudes of the potential user population that preclude or limit decoder purchase.

To address the research questions in this study, four major activities were undertaken. First, a literature review was conducted to provide background information on: the prevalence of hearing impairment in the U.S. and the trends in prevalence rates among the hearing-impaired population; characteristics of television decoder owners and non-owners; television viewing patterns of the hearing impaired; amount of closed-captioned programming available; and potential factors limiting penetration of the decoder market.

Second, data from the 1986 National Health Information Survey (NHIS) conducted by the National Center for Health Statistics (NCHS) were reanalyzed to determine the size of the deaf and severely hard-of-hearing population. Third, focus groups were conducted to investigate the factors that affect demand for decoders among this population. And finally, interviews with the staff at the National Captioning Institute, program staff at the Department of Education, and representatives of other organizations were conducted to obtain information about the supply of the first-, second- and third- generation decoders. In the methodology section that follows, we discuss each of these activities in greater detail.

Organization of the Report

The remainder of this report is divided into five chapters. Chapter II, Methodology, discusses the data used to estimate the potential market for decoder users and the limitations of the various survey techniques used to collect the data. It also discusses the approach and limitations to reanalyzing the 1986

NHIS, explores various strategies for co !ucting a market analysis, and provides an in-depth discussion of the focus group methodology utilized in this study.

Chapter III, Findings: Population, presents the estimated size of the deaf and hard-of-hearing population based on the literature review and a reanalysis of the 1986 NHIS. Included in these estimates are subsets of the population that may affect potential decoder purchase. Population trends among the hearing impaired are also discussed.

Chapter IV, Findings: Demand for Decoders, discusses the factors explored in each focus group which may have influenced the participants' decisions to purchase -- or not to purchase -- a decoder in the past, or affect purchase of a new decoder in the future. Comparisons are made between the responses of the user and the non-user populations, and between the deaf and hard-of-hearing populations.

Chapter V, Findings: Supply of Decoders, discusses the production, distribution, marketing and inventory of decoders and briefly describes the technical features of each generation of decoders.

Chapter VI, Conclusions, provides a description of future activities needed to definitively determine the demand for decoders.

CHAPTER II: METHODOLOGY

The study of the demand for closed-captioned decoders required the conduct of several different analyses. These included: estimates of the population of potential users of decoders; estimates of the demand for decoders, including factors associated with the purchase, or the non-purchase, of decoders; and finally, estimates of the supply and sale of decoders. As each of these analyses employed different methodologies, we precede our discussion of study findings with a brief overview of these methodologies in this chapter of the report.

Estimating the Population of Potential Decoder Users

To estimate the potential population of users of closed-captioned decoders, two activities were undertaken. The first was a review of existing studies that provide estimates of the hearing-impaired population; the second was an analysis of the 1986 National Health Interview Survey (NHIS) to obtain more detailed estimates of the number of people in selected subgroups of this population.

Review of Existing Studies

There are several sources for estimating the number of hearing-impaired people in the United States. One primary source is the NHIS conducted annually by the National Center for Health Statistics (NCHS). The data collected by the NHIS are based on a household survey of the civilian noninstitutionalized population. In 1986, the interviewed sample was composed of 23,838 households, containing 62,052 persons.

The 1986 NHIS asked respondents whether they or other members of their families had three specific hearing impairments. These included: deafness in one or both ears; any other trouble hearing with one or both ears; and tinnitus or ringing in the ears. Although responses to these questions can be used to provide overall estimates of the hearing-impaired population, they do not permit differentiation of the degree of hearing loss. That is, it is not possible to determine whether hearing-impaired people are mildly or severely impaired -- a factor which is extremely important in estimating the potential market for closed-captioned decoders. Estimates of the number of severely hearing-impaired people can only be made from the 1971 and 1977 surveys, which

included supplementary questions on the level of hearing impairment for the population aged three years and older.

In addition to the NHIS, three other studies have estimated the size of the hearing-impaired population. The most recent of these studies is the Survey of Income and Program Participation (SIPP), a 1984 survey conducted by the Bureau of the Census, which provided data on the levels of hearing impairment for the population aged 15 years and older. The SIPP estimated the prevalence of the hearing-impaired population based on the respondents' ability to hear what was said in normal conversation, with a hearing aid if it is usually worn.

Earlier studies include the National Census of the Deaf Population (NCDP), conducted in 1971 by the National Association of the Deaf and the Deafness Research and Training Center at New York University, and the National Health and Nutrition Survey (HANES), formally known as the National Health Examination Survey, conducted in cycles since 1960. The NCDP was concerned with estimating the number of persons who are prevocationally deaf, i.e., those persons who lost their ability to hear prior to the age of 19. The HANES, which was conducted most recently in 1974-75, involved a clinical examination of a representative sample of people aged 25 to 74 that estimated levels of hearing impairment based on decibel levels set by the American National Standards Institute (ANSI). However, because only about 3,054 people aged 25 to 74 -- out of an estimated 108.5 million persons -- were given the audiological tests, the HANES cannot be used to accurately project the number of severely hearing-impaired people in the population.

Analysis of the 1986 National Health Interview Survey

After reviewing existing studies to estimate the overall magnitude of the hearing-impaired population, we followed up this review with new analysis of the 1986 NHIS data tapes in an effort to refine the estimate of the potential market for closed-captioned decoders. The new analysis of the NHIS was based on the recognition that the market for decoders does not include all hearing-impaired people.

The hearing-impaired population includes individuals who, for a variety of reasons, are unable to benefit from decoders. Most obvious are individuals who, in addition to their hearing impairments, also have severe visual impairments that would limit or preclude them from reading the television captions. Another group is those who would not be able to benefit from the decoder because their reading ability is too low to read the captions. (Several studies, including Trybus and Karchmer (1977), have shown that reading levels of hearing-impaired people are well below those of the average person.) This group would also

include children under age five who, for the most part, have not had any formal instruction in reading.

The refinement of estimates of the hearing-impaired population that would constitute the actual market for decoders was undertaken using the following methodology. First, the hearing-impaired population was defined as people who were deaf and people who were severely bilaterally hard of hearing. Estimates of the deaf population were provided in the 1986 NHIS and the market within this population was established in the following way.[1]

First, the deaf population was differentiated into groups that were considered to be potential users of decoders and others that, for reasons stated above, were considered unlikely to be able to use the decoder. The first division of these populations was based on visual ability. The deaf were divided into two groups: individuals with visual impairments and individuals without visual impairments.

The first group was regarded as unable to use the close-captioned decoder because of visual impairments and was therefore excluded from the market for the product. The second group, i.e., individuals without visual impairments, was then further separated into subgroups based on age. These groups included children under five and children and adults in the following age ranges: 5-17; 18-24; 25-44; 45-64; and 65 and over. Children under five were excluded from the market because it was assumed that they would be unable to read the captions; the remaining groups were included as potential users of the decoder. Finally, individuals over five years of age were separated into two groups based on the grade level they had attained in school. One group included individuals who had completed an elementary-school education or less than nine years of schooling; the second group included those individuals who had completed nine or more years of schooling. The first group was excluded from the market, since it was assumed that these individuals would probably not be able to read the captions; the remaining individuals, with nine or more years of schooling, were included in the market for decoders, since it was assumed that their reading levels would be high enough to enable them to read the captions. Figure 1 provides a pictorial presentation of the process used for the deaf population.

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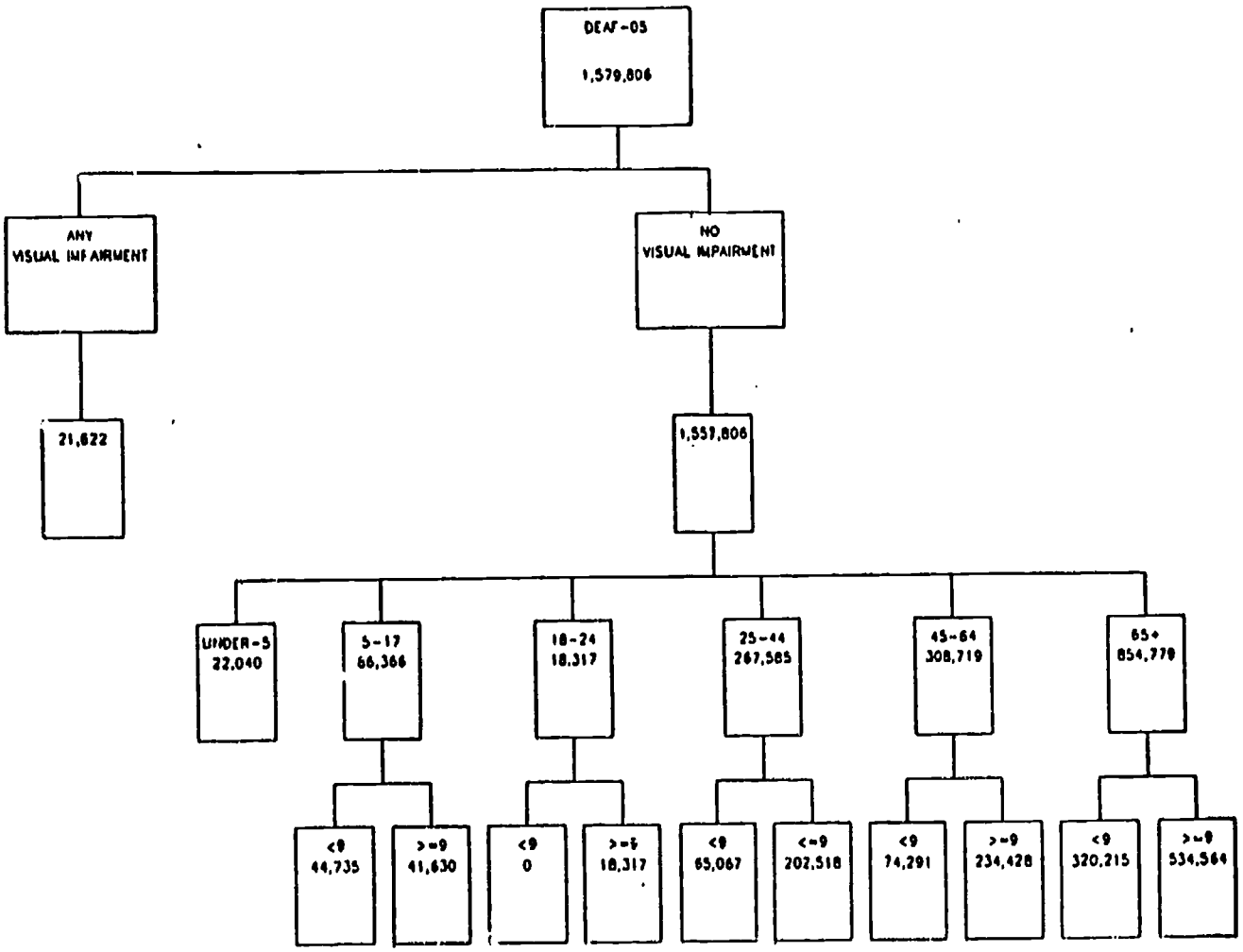
[1]Prior to the 1979 NHIS, the deaf category was limited to persons who were totally deaf. After 1979, the word "total" was dropped from the questionnaire. It is possible therefore that persons who are profoundly or severely hearing impaired may now be included in the deaf category, thereby increasing the numbers of persons who fall into this category.

FIGURE 1

REPRESENTATION OF THE PROCESS USED TO IDENTIFY DEAF DECODER USERS



Key: <9: Under 9 Years of Schooling Completed
>9: 9 or More Years of Schooling Completed

Several points about the analysis of the NHIS data need to be mentioned at this point. First, the same type of differentiation of the market for decoders was attempted for the severely hearing-impaired population, but this was not possible for the following reasons. Data on the number of persons who are identified as severely hearing impaired were not available. The 1986 NHIS, unlike the 1977 NHIS, did not include a special set of supplementary questions on hearing impairment or the scaling of responses based on the Gallaudet Hearing Scale. Therefore, we could not differentiate the levels of hearing impairment among the bilaterally hard of hearing to estimate the severely hard of hearing. Furthermore, because the supplementary questions on the 1977 Gallaudet Hearing Scale were different from those on the 1986 NHIS, we could not make legitimate estimates of the severely hearing impaired by applying the 1977 supplementary data to the 1986 NHIS.

Second, the restriction of the market for decoders to individuals with at least an elementary-school level of education may not accurately define the market for decoders. Research has not established the relationship between reading level and grade level attained for the hearing-impaired population. It would be anticipated that some proportion of individuals who have completed higher levels of education may not be able to read well enough to utilize the decoder, and that a proportion of people who have completed lower levels of education might, in fact, be able to read the captions.

Finally, there are two populations that may have been excluded from the market for decoders, but who may in fact constitute special markets for the product. These include children under five years of age who may currently not read well enough to use the decoder, but who may be able to use it in the future and school-age children (5-17 years old) who may also not be able to read the captions but who may be able to use the decoder as an aid to learning to read. (There is some research evidence that suggests that captioning enhances the reading skills of the deaf and hard-of-hearing population (Gates, 1970; Boyd and Vader, 1972; Shroyer, 1973; Caldwell, 1973). While children under five years of age and children 5-17 years of age with less than an elementary education may not be included in the current market for decoders, these are populations that could benefit from decoders in the future and therefore might be a target of special marketing efforts.

Identifying Factors in Decoder Demand: Focus Groups

To estimate the potential market for decoders, a number of alternative research strategies were considered. These included: an analysis of sales records of decoders to estimate the

elasticity of demand for decoders; an econometric analysis of elasticity of demand based on a comprehensive survey that would generate the target population's "revealed preferences" for decoders with different specifications; and the use of focus groups to explore factors that affect decoder purchase among the target populations.

The methodology for a sales analysis would have involved the collection of sales records of decoders that included the number of sales for decoders with different specifications at different prices. The data collected would then have been analyzed to determine whether -- and to what extent -- the volume of sales increased with decreases in price for the product. We chose not to use this method, however, because it was not technically feasible to assemble the data required for this analysis within the resources of this study. Alternative methods were therefore considered.

A second way to estimate the market for closed-captioned decoders would have been to conduct an econometric analysis of the elasticity of demand based on a survey of the target populations, i.e., the deaf and severely hearing impaired. This analysis would have involved a comprehensive survey using random sampling techniques to provide answers to a wide range of questions about the potential demand for decoders. Several factors, however, in addition to resource limitations, precluded the use of such a survey in this study. Most important is the lack of information about the target population and its attitudes for decoders that would be needed to structure the questionnaire for the survey. A second factor is the reading skills of the target population. Prelingually deaf and hard-of-hearing respondents with marginal literacy skills may not fully comprehend the questions on a written survey. Sampling only those individuals with adequate reading skills, however, would bias the results of the survey.

The limitations associated with the above methodologies led to the use of focus groups as the approach to learning more about preferences for decoders -- and ultimately for assessing the potential market for the product. Focus groups are a marketing research technique involving discussion groups led by a trained moderator and recorded in detail by an individual who observes the groups. They generally involve homogeneous groups of eight to 12 consumers and last two to three hours. Focus groups are used in marketing research: 1) as a basis for studies that create new products; 2) for studies to position products in the market; 3) for advertising and communications research; 4) for background studies of consumers' frames of reference; and 5) to determine attitudes and behaviors of consumers.

The basic value of focus groups, like intensive case studies, is to provide rich, in-depth information on a subject. They improve understanding of what the issues really are by allowing the

moderator to probe for underlying attitudes, feelings, and reactions. There are, however, some limitations to the focus group methodology.

Unlike a survey, a focus group does not provide the data to estimate the number of people who would purchase a product with particular features at a particular price. Nor does it permit an estimate of the number of purchases of a product when the price and the features of the product are modified. The sample of respondents is much too small and may not be representative of the larger population. In addition, the participant responses may not be independent, i.e., they may be subject to some peer pressure. Despite these limitations, we chose to use the focus group methodology because it was the most viable strategy within the resource constraints of the study.

Focus Group Methodology

Since focus groups consist of a homogeneous grouping of consumers, the first task in this study was to identify the target audiences who represent the potential users of decoders. Once this was accomplished, the next step was to develop the research questions that would be investigated during the focus groups.

To identify target audiences for the focus groups, interviews were conducted with representatives of organizations and institutions serving the hearing-impaired community. These individuals were identified through the literature review and discussions with appropriate staff in the Department of Education. Interviews were conducted with representatives of the following organizations and programs.

- Self Help for the Hard of Hearing (SHHH)
- Washington Area Group for the Hard of Hearing (WAGHOH)
- The Alexander Graham Bell Association for the Deaf, Inc.
- The American Society for Deaf Children
- Parents from the Kendall Demonstration Elementary School
- Principal, Camelot Elementary School, Fairfax County Public Schools, which houses the Camelot Center, a public school program for the hearing impaired
- Supervisor, Auditory Programs, Montgomery County Public Schools
- Supervisor, Auditory Programs, Fairfax County Public Schools
- Executive Director, Telecommunications for the Deaf, Inc. (TDI)
- Executive Director, Deafpride, Inc.
- Faculty members and researchers from Gallaudet University
- Director, Technology and Assessment Programs, Gallaudet University

The interviews provided a more accurate assessment of the characteristics and needs of the different segments of the hearing-impaired population and led to the selection of six target audiences for the focus groups. These included:

- o Deaf persons who have purchased decoders;
- o Deaf persons who have not purchased decoders;
- o Severely hard-of-hearing persons who have purchased decoders;
- o Severely hard-of-hearing persons who have not purchased decoders;
- o Parents of deaf or severely hard-of-hearing children who have purchased decoders; and
- o Parents of deaf or severely hard-of-hearing children who have not purchased decoders.

The elderly population who became deaf or hard of hearing later in life were included among the deaf and hard-of-hearing target audiences. This group was essential to the study, as it constitutes an increasing portion of the deaf and hard-of-hearing population, but also a population that tends not to use the decoder very much.

Specific issues to investigate in the focus groups were developed through information obtained through the literature review and interviews with representations of the hearing-impaired community and Department of Education staff. The following research questions were addressed in each group:

- o What are the key factors that affect the decision to purchase a closed-captioned decoder -- or a second decoder?
  - Attitudes towards the purchase of televisions and related equipment;
  - Knowledge and awareness of decoders;
  - Quality of captioning;
  - Influence of family members;
  - Amount of closed-captioning programming;
  - Perception of hearing ability;
  - Use of alternative listening devices; and
  - Current decoder technology.

Selection of Focus Group Participants

Before proceeding with the focus groups, two issues required special attention. The first concerned the deaf population. The consensus among persons interviewed was that candidates among the deaf population in the Washington area may not be representative of this population nationwide. The presence of Gallaudet University and the special deaf elementary and secondary schools in the District of Columbia, as well as the headquarters of

several deaf organizations, offers a rich resource for persons residing in the area. It is likely that Washington may have a more well-educated, well-organized, and well-informed deaf population than many other parts of the country.

The second issue concerned reaching hard-of-hearing individuals who did not have strong organizational affiliations. Affiliated individuals have a network through which information is exchanged and are therefore generally more knowledgeable about assistive devices that could enhance their lives. As one member of the Northern Virginia SHHH stated, "reaching the unaffiliated is the $64,000 question. Persons who do not join organizations do not consider themselves hard of hearing."

Several measures were taken to include a more representative population and to reach the unaffiliated in the deaf and hard-of-hearing communities.

Deaf Participants. To include a more representative population, the study was expanded to include both the Washington and Baltimore metropolitan areas. Baltimore was selected as a second site for the focus groups because of proximity and the greater potential for reaching the more "typical" deaf population. Two focus groups were organized in Baltimore representing decoder owner and non-owner populations, and two in Washington representing these same groups.

In Baltimore, potential participants were contacted through the Silent Orioles, Inc., a deaf club located in downtown Baltimore. The club was initially contacted through Alfred Sonnenstrahl, Executive Director of Telecommunications for the Deaf, Inc., (TDI), who worked with the club's president in soliciting candidates. The major difficulty encountered was reaching the deaf non-owner population. This was caused by two factors which limited contact with this group -- the lack of affiliation with any deaf club or organization, and the limited ownership of telecommunication devices such as TDDs. Contacts were made through door-to-door, word-of-mouth solicitations by a member of the Silent Orioles Club, whose husband participated in the deaf, decoder-owner focus group. Most of the participants in the non-owner group lived in a nearby, low-income, housing project.

In Washington, the decoder-owner population was reached through a random sample of names from the directory of Telecommunications for the Deaf, Inc. in the Washington, Maryland, and Northern Virginia areas. An assumption was made that if deaf individuals owned a TDD they were likely to own a decoder. The sampled names were then reviewed by Alfred Sonnenstrahl to screen out leaders of the deaf population. The Executive Director of the Senior Center for the Hearing Impaired, Jeffrey Bowden, was also contacted to help identify potential candidates.

The non-decoder owners were reached through Deafpride, Inc., a non-profit organization providing social services for the inner-city, deaf community. A cross-section of participants was requested to include minority and non-minority individuals, as well people with low and middle incomes. Ann Wilson, Executive Director of Deafpride, was instrumental in organizing this group. The focus group was held at Deafpride so that participants would feel comfortable with their surroundings.

Hard-of-Hearing Participants. Hard-of-hearing candidates were solicited through a variety of measures. The first and simplest approach was to contact organizations representing this population. The following organizations were contacted:

- The Northern Virginia Chapter of SHHH. A mailing list of members was provided by the organization. The individuals on the list received letters about the study and were asked to participate in a discussion group on the use of television by the hard of hearing.

- Montgomery County Chapter of SHHH. A flier was placed in the monthly newsletter describing the study and requesting participants for the discussion group.

- Washington Area Group for the Hard of Hearing. In addition to placing a flier in the organization's monthly newsletter, the study was announced at the monthly membership meeting.

Reaching the non-affiliated, hard-of-hearing group was more challenging. Since much of the target audience were elderly people who lost their hearing later in life, several strategies were employed to reach this population segment. They included the following:

- Senior citizen organizations such as the National Council on the Aging and Iona House were contacted. Iona House is a non-profit organization providing senior citizen services and adult day care.

- Potential candidates were identified by the Executive Director of the The Senior Center for the Hearing Impaired.

- Fliers briefly describing the study were sent to various senior citizen residences and recreational facilities. Fliers were posted on bulletin boards and potential candidates were asked to contact Pelavin Associates by telephone or letter.

- Fliers briefly describing the study were posted in various hearing aid centers and potential candidates were asked to contact Pelavin Associates by telephone or mail.

- Northern Virginia SHHH members who lead seminars on coping with hearing loss provided lists of non-affiliated individuals who had attended their seminars.

Parent Participants. Parent organizations were contacted through area school systems and parent organizations. The following measures were taken to reach both mainstream and special class/special school students.

- Montgomery County School System, Maryland. Letters soliciting potential candidates were sent to parents from Sheila Doctors, Supervisor of Auditory Programs in the district.

- The American Society for Deaf Children provided contact with the Montgomery County Association for Hearing-Impaired Children (MCAHIC). Parents affiliated with MCAHIC provided names of potential candidates.

- Fairfax County School System. Donald McGee, Supervisor of Auditory Programs in Fairfax County helped to identify candidates.

- Hearing Education Association for the Region of Northern Virginia (HEAR NOVA) provided a mailing list of members. Names were sampled to represent a variety of schools within the region.

- Camelot Elementary School, Virginia. Connie Rahill, Principal, assisted in providing parent names of children attending the Camelot Center, a special program for hearing-impaired children in grades pre-K through 6, housed within the elementary school. Students in the program are mainstreamed, where appropriate.

- Kendall School for the Deaf, Washington, D.C. Letters soliciting potential candidates were sent out to parents by Janice Wellborn, the Principal of the school.

- Model Secondary School for the Deaf, Washington, D.C. The school's admissions office provided a list of potential candidates; names were sampled from that list.

- Fliers were also posted in sign language classes at Gallaudet University to solicit responses from parents of children at the Kendall School.

Conduct of the Focus Groups

Pelavin Associates conducted 10 focus groups between July 20th and October 5th, 1988. Figure 2 provides information on the location, dates, and number of participants in each discussion group. The hard-of-hearing and parent groups were conducted by Judith Harkins, Director of the Office of Technology Assessment, Gallaudet University, who is a trained and experienced group leader. The deaf groups were led by Alfred Sonnenstrahl, Executive Director of TDI, also a trained and experienced group leader, and interpreted by Dr. Harkins. An audio loop was provided for the hard of hearing to facilitate group discussions. A record of the content of each group was maintained by tape recording each session and by having the group observer take notes.

Dr. Harkins developed a moderator's guide to insure that group discussions proceeded according to a predetermined agenda. The guides consisted of three major parts:

- An introduction that introduced participants, explained the project, and provided the ground rules for the discussion;
- A discussion of factors that affect decoder purchase; and
- A closing section that centered on the preferred features for future decoders for the owner groups and attitudes about decoder purchase for the non-owner groups.

The substance of the guides reflected the issues raised through the literature review and the interviews conducted with a cross-section of the hearing-impaired community. A draft of each of the guides was submitted to the Department of Education and to the National Captioning Institute for review. A copy of each of the moderator's guides is attached as Appendix A.

Both owner and non-owner guides elicited similar background information about the participants' use and ownership of televisions and related equipment. The owner's guide explored circumstances relating to the participants' purchase of the decoder, their general attitudes towards captioning and closed-captioned programming, their opinions about the new TeleCaption 3000, and their preferences for features in a future-generation decoder. The non-owner's guide explored television viewing patterns and techniques used by participants to compensate for their hearing loss. It also explored participants' awareness of closed captioning before introducing the decoder to the group. Participants' initial reactions to the decoder and captioning were recorded and factors that might affect decoder purchase were explored.

FIGURE 2

SCHEDULE OF FOCUS GROUPS

Date	Location	Target Population	Number of Participants
July 18 1988	Baltimore (Silent Orioles Club, Inc.)	Deaf decoder owners	8
July 19, 1988	Washington	Deaf non-owners	7
July 20, 1988	Baltimore (Silent Orioles Club, Inc.)	Deaf non-owners	14
July 21, 1988	Washington	Hard-of-hearing non-owners	9
July 25, 1988	Washington	Hard-of-nearing owners	9
July 27, 1988	Washington	Deaf decoder owners	9
Aug. 2, 1988	Washington	Hard-of-hearing non-owners	8
Sept. 19, 1988	Washington	Hard-of-hearing owners	7
Sept. 24, 1988	Washington	Parent decoder owners	8
Oct.5, 1988	Washington	Parent non-owners	8

During each focus group, participants viewed a segment of a movie or a television program that was closed-captioned. Owner groups viewed a situation comedy and non-owners, with the exception of the parent group, viewed a movie and a more rapid-dialogue documentary. The parent group viewed the situation comedy. Non-owners viewed the program first without captions and then with captions.

Demographic Profile of Focus Group Participants

Prior to the start of each focus group, participants were asked to complete a brief demographic profile. A copy of the profiles is attached as Appendix B. Information was thus obtained on the age, level of hearing loss, education, employment status, organizational affiliations, and the use of assistive devices for each of the deaf and hard-of-hearing participants. Parents completed a profile for each of their hearing-impaired children which, in addition to age, level of hearing loss, and use of assistive devices, included information on educational programs attended, history of hearing loss in the family, and modes of communication with the child (or children). A brief analysis of the demographic profile for each target population appears in Appendix B.

CHAPTER III: FINDINGS: POPULATION

Size of the Hearing Impaired Population

To estimate the potential market for closed-captioned decoders, we reviewed existing studies of the size of the hearing-impaired population in the United States. As discussed in Chapter II, these studies included: the National Health Information Survey (NHIS), conducted annually by the National Center for Health Statistics (NCHS); the 1984 Survey of Income and Program Participation (SIPP), conducted by the Bureau of the Census; the National Health and Nutrition Examination Survey (HANES), conducted most recently by the NCHS in 1974-75; and the National Census of the Deaf Population (NCDP), conducted in 1971 by the National Association of the Deaf and the Deafness Research and Training Center at New York University.

These studies define the hearing-impaired population in different ways and use different methodologies to estimate the size of this population. In addition, some studies, such as the HANES, cannot be used to project the number of people with hearing impairments because a very small sample of the total population was given a physical examination. The research, nonetheless, suggests the following conclusions about the prevalence of hearing impairments in the U.S. population.

- **THE NUMBER OF HEARING-IMPAIRED PEOPLE IN THE UNITED STATES IS BETWEEN 16 AND 21 MILLION. THIS INCLUDES PEOPLE WHO ARE MILDLY TO SEVERELY HARD-OF-HEARING OR WHO ARE DEAF IN ONE OR BOTH EARS. THE NUMBER OF PEOPLE WHO ARE DEAF IN BOTH EARS IS BETWEEN 292,000 AND 1.6 MILLION. IT IS NOT CURRENTLY POSSIBLE TO IDENTIFY THE NUMBER OF HARD-OF-HEARING PERSONS WHO ARE SEVERELY IMPAIRED.**

The National Health Interview Survey estimated in 1986 that there were approximately 21 million persons who were hearing impaired. The survey does not, however, permit differentiation of the severity of people's hearing impairments -- and is therefore limited in its utility to estimate the potential market for closed-captioned decoders. Earlier surveys by NCHS, which include additional information on the level of hearing impairment provide more detailed estimates of this population.

The 1977 NHIS, for example, estimated that 16.2 million people had some difficulty hearing, of whom about 7.3 million aged three

and over had a bilateral hearing loss including deafness. On the Gallaudet Scale among the bilaterally hearing impaired, an estimated 842,000 people could at best hear words shouted in the ear; 2.3 million could hear words shouted across a room; and almost 4 million could hear words spoken in a normal voice. An estimated 292,000 people categorized themselves as deaf on the self-rating scale.

The 1984 SIPP, which estimated the prevalence of the hearing-impaired population based on respondents' ability to hear what was said in normal conversation, estimated that there were about 7.2 million persons age 15 years and over (4.0 percent of the population) who had difficulty hearing such speech. Within this population, 2.3 million had a severe functional limitation, and about 481,000 people (0.3 percent of the total population aged 15 years and over) were completely unable to hear what was said in normal conversation.

Although people in all age groups in the population suffer from hearing impairments, the prevalence of hearing impairments is not consistent throughout the population. Studies of the hearing-impaired population demonstrate consistently that:

- **THE PREVALENCE OF HEARING IMPAIRMENTS IN THE POPULATION RISES DRAMATICALLY WITH AGE. IN 1986, THE PREVALENCE RATE OF 295.6 PER 1000 POPULATION FOR PEOPLE OVER 64 YEARS OF AGE WAS NEARLY 15 TIMES HIGHER THAN THE PREVALENCE RATE FOR PEOPLE UNDER 17 YEARS OF AGE.**

It was estimated in 1986 that of the nearly 21 million people with hearing impairments, about 8.1 million -- or about 39 percent of the total -- were people aged 65 and over. In contrast, people under 18 represented only about 6 percent of people with hearing impairments, people aged 18 to 44 about 25 percent of the hearing-impaired population, and people aged 45 to 64, about 29 percent of the hearing-impaired population.

While about eight million elderly people are currently estimated to suffer from some type of hearing impairment, The Office of Technology Assessment estimates that the number of hearing-impaired elderly will increase to about 11 million by the year 2000. However, only a small percentage of the hearing-impaired elderly are deaf. It is estimated, according to audiometric tests, that about two to four percent of all elderly people are deaf, although estimates are somewhat higher for people over 75. If severe hearing impairments are included, the prevalence of hearing impairment increases significantly in the elderly population.

At the other end of the spectrum, it should be noted that there has been a decline in the incidence of hearing impairments in the youngest age groups of the population. The Office of Special

Education and Rehabilitative Services (OSERS) reports that the number of students under 21 with hearing impairments (in the states reporting these data) declined by about one-fourth between 1976 and 1986 -- from 87,376 to 65,153. This decline was primarily the result of a national rubella immunization program implemented in 1969 that produced a reduction in the number of children born with maternal rubella-related deafness during the early 1970s. In future years, it is expected that there will be a smaller decline in hearing impairments related to rubella but that the decline will continue with the absence of other deafness-causing epidemics.

In addition to differences in the prevalence of hearing impairments in different age groups, there also appears to be a relationship between hearing impairment and income. National surveys of hearing impairment show that:

- **PERSONS WITH LOWER INCOME, THROUGH AGE 74, ARE MORE LIKELY TO BE HEARING IMPAIRED THAN PEOPLE IN HIGHER INCOME CATEGORIES.**

- **REGARDLESS OF INCOME, PREVALENCE OF HEARING IMPAIRMENT INCREASES WITH AGE.**

Estimates of the prevalence of hearing impairments among different age and income groups by the 1986 NHIS indicate that for people under 45, the prevalence of hearing impairment is about 52 percent higher among people with incomes under $10,000 than among people with incomes above $35,000. For people in the age group from 45 to 64, the rates are about 24 percent higher, and for people age 65 to 74, they are about 15 percent higher. However, for people aged 75 and over, the patterns are reversed: the prevalence rates of hearing impairments are about 32 percent higher among people with incomes above $35,000 than people with incomes below $10,000.

Although reasons for the relationship between low family income and a higher rate of hearing impairment for people under 75 years of age are not known, it could be attributed to the fact that lower-income groups have poorer general health, poor primary health care, and greater exposure to environmental noise. The reverse in the prevalence of hearing impairments in the oldest group in the population may be due to the fact that people with higher incomes may live longer than their poorer contemporaries.

In summary, the prevalence of hearing impairment tends to be higher among the elderly population than the young and among lower-income people than people with higher incomes. The elderly poor may therefore represent a significant portion of the potential market for closed-captioned decoders.

The Market for Closed-Captioned Decoders

Estimates of the hearing-impaired population range from about 16 million in the 1977 NHIS to about 21 million in the 1986 NHIS. It must be recognized, however, that the market for closed-captioned decoders may be smaller than either of these figures, since the hearing-impaired population includes individuals who, for a variety of reasons, may be unable to benefit from decoders. To refine our estimates of the potential market for decoders, we therefore analyzed the 1986 NHIS data tapes using a methodology described in Chapter II.

The 1986 NHIS identifies approximately 1.6 million people as deaf in both ears, based on responses to questions about their hearing impairments. This figure corresponds with the average estimate of the 1983 through 1985 NHIS which estimated 1.7 million persons as deaf in both ears. Although this figure is about five times higher than the 1977 estimates derived from the Gallaudet hearing scale, we nonetheless use this figure because it is the only one currently available and suitable for estimating the potential market for decoders among the deaf. Our analysis leads to the following conclusions about the market for decoders in the deaf population.

- **THE MAXIMUM MARKET FOR CLOSED-CAPTIONED DECODERS IN THE DEAF POPULATION IS 1.58 MILLION.**

- **ELIMINATING FROM THE MARKET PEOPLE WITH VISUAL IMPAIRMENTS REDUCES THE NUMBER OF POTENTIAL USERS OF DECODERS FROM 1.58 MILLION TO BETWEEN 1.45 AND 1.56 MILLION.**

- **ELIMINATING PEOPLE UNDER FIVE WHO MAY BE TOO YOUNG TO READ THE CAPTIONS AND PEOPLE WITH LOW LEVELS OF EDUCATIONAL ATTAINMENT WHO MAY NOT READ WELL ENOUGH TO BENEFIT FROM CAPTIONING REDUCES THE NUMBER OF POTENTIAL DEAF USERS TO BETWEEN 959,000 AND 1.03 MILLION.**

The 1986 NHIS estimates that approximately 1.58 million people are deaf in both ears. Assuming that all people in this population had no visual impairments that limited their ability to read the captions well enough to benefit from the decoder, the market for decoders in the deaf population would, in fact, be at the 1.58 million level. However, this is not the case. It is estimated that almost 1 1/2 percent of this population is blind in both eyes and that nearly nine percent of this population has one of three visual handicaps: blindness in both eyes; visual impairment in both eyes; or blindness in one eye and visual impairment in the other eye. By excluding only people who are blind in both eyes from the market for decoders, the number of potential users is reduced to about 1.56 million; (See Table 1.)

excluding people with any of the visual impairments cited above reduces the number of potential users to 1.45 million.

In addition to visual impairments, other factors may limit the ability of deaf people to use decoders. As discussed in the Methodology chapter, limited reading ability is one of these factors. The NHIS, however, does not provide information on the reading ability of survey respondents, thus precluding the inclusion of reading ability in the analysis. It does, however, include information on the age of respondents and their years of schooling completed. For this analysis, we assumed that children under five years of age would not be able to use the decoder because they had not yet received sufficient reading instruction to benefit from the decoder, and therefore were excluded from the current market. Also, recognizing that hearing-impaired people had lower reading levels than the average person, we limited the market for decoders to individuals who had completed at least an elementary-school education (eight or more years of schooling). We recognize that some people who have completed more than eight years of schooling may not be able to read well enough to understand the captions and that people with less formal education -- particularly elderly people who lost their hearing later in life -- may read well enough to benefit from the decoder. But the objective of this analysis was only to refine the parameters of the market for decoders, not to generate a single estimate of this population.

Excluding children under five from the deaf population that is not blind in both eyes reduces the number of potential decoder users to 1.54 million; excluding people over five years of age who have less than an elementary-school education further reduces the number to 1.03 million. When children under five are excluded from the deaf population that is blind or visually impaired in both eyes or blind in one eye and visually impaired in the other eye, the number of potential users of decoders is reduced to 1.43 million; excluding people over five years of age with less than an elementary-school education further reduces the market to 959,000 people.

TABLE 1

ESTIMATES OF THE SIZE OF THE MARKET FOR CLOSED-CAPTIONED DECODERS AMONG THE DEAF POPULATION

Procedure for Estimating the Deaf, Literate Population with Good Vision in at Least One Eye			Procedure for Estimating the Deaf, Literate Population with Some Vision in at Least One Eye		
Total deaf population		1,579,427	Total deaf population		1,579,427
Subtract persons who are blind or visually impaired in both eyes or blind in one eye and visually impaired in the other	-	127,575	Subtract persons who are blind in both eyes	-	21,621
		1,451,852			1,557,806
Subtract children under 5 years of age	-	22,310	Subtract children under 5 years of age	-	22,040
		1,429,542			1,535,766
Subtract persons who have not completed elementary school	-	470,105	Subtract persons who have not completed elementary school	-	504,309
Deaf persons with good vision in at least one eye, over age 5, and having completed elementary school		959,437	Deaf persons with at least some vision in at least one eye, over age 5, and having completed elementary school		1,031,457

Source: Data tapes from the National Health Information Survey, 1986 (Department of Health and Human Services, National Center for Health Statistics).

CHAPTER IV: FINDINGS: DEMAND FOR DECODERS

To estimate the potential demand for closed-captioned decoders, focus groups were conducted with a sample of owners and non-owners from three groups: the deaf; the severely hard-of-hearing, and parents of deaf and severely hard-of-hearing children. The focus groups were designed to explore the factors that influenced the decisions of decoder owners to purchase the decoder and factors that may have deterred non-owners from making such a purchase. The factors examined included:

- Knowledge and awareness of decoders;
- Purchasing patterns of televisions and related equipment and services;
- Amount of closed-captioned programming;
- Perception of hearing ability;
- Use of other assistive hearing devices;
- Current decoder technology;
- Price of decoders; and
- Quality of captioning.

In analyzing the comments made by participants in the focus groups, an effort was made to identify generalizations that applied to the different populations, i.e., the deaf, the severely hard-of-hearing, and parents of deaf and severely hard-of-hearing children, and to distinguish differences between these groups where they were evident. This chapter presents the insights gained about factors affecting the purchase, or the non-purchase, of decoders from the focus groups.

Factors that Deter the Purchase of Closed-Captioned Decoders

Several factors appear to be associated with people's decisions not to purchase a decoder. Three of the key factors are the lack of knowledge about decoders, the perception that the loss of hearing is not sufficiently great to warrant the purchase, and the use of other techniques to understand television.

- **THE HEARING-IMPAIRED POPULATION LACKS INFORMATION ON THE CAPABILITIES OF DECODERS, THE PRICE OF DECODERS, AND THEIR PLACE OF PURCHASE.**

The focus groups revealed that lack of knowledge about decoders is a major deterrent to the purchase of the product. This problem is particularly acute among participants in the deaf groups who cited very few sources of information about the decoder. Note that this is especially significant because the consensus among the deaf community was that the deaf in the Washington area were a more educated, more well-organized community than the deaf in many other parts of the country. Only about one third of the participants in the deaf groups could remember where they first heard about decoders. Those who knew about the decoders cited friends and school as their major source of information. Many of the people in the latter group, however, had attended the Model Secondary School for the Deaf.

Parents of deaf and hard-of-hearing children generally felt that there was insufficient information about decoders. As one parent stated, "There is a shortage of information and you have to actively seek it out." However, parents whose children attended a special school for the deaf or the hard-of-hearing appeared to have more information about decoders than parents whose children were mainstreamed in the public schools. Parents whose children were isolated within the school system and had an itinerant teacher for the deaf tended to have the least information about decoders. As one parent indicated, "If you're not a member of a parent group, and you've got a deaf kid who is mainstreamed, and he's the only deaf kid in his school, you're not going to get the information."

One parent actually only learned about the decoder by chance while shopping at Sears. As the women said, "They had one on display and I said, 'What is this?' This is wonderful and I bought it."

A number of parents of deaf and hard-of-hearing children did not even know what captioning is; others lacked information about the technology of the decoder and its capabilities. One parent, whose child was multiply handicapped, thought captioning occurred when the person speaking faced you all the time and the viewer could read the person's lips. Another parent who knew something about decoders felt that the commercial brochures were not sufficiently informative to result in a purchase of the product. As she summed up the situation, "I probably would have decided to buy (a decoder) if I had more information. The information they send you is usually very commercial. They just say a few words about (the decoder). And you don't feel very comfortable just getting something because they are selling it. We need to know more."

In contrast with the participants in the deaf and parent groups, members of the hard-of-hearing group appeared to have more information about decoders. The majority had heard about them through hard-of-hearing organizations with which they were affiliated or had received information through a mailing list. However, although a large number of focus group participants had seen captions before attending the session, many were still unclear about what a decoder was. One hard-of-hearing person described a decoder as "a device that was about half the size of a television screen, cost $250, and was hooked up with a mass of spaghetti."

In addition to a lack of knowledge of what decoders were, most non-owners had only a vague idea about decoder cost. However, the perception of several participants in the focus groups was that the decoder was expensive. When asked to estimate the price of the TeleCaption 3000, almost half of the deaf participants at Deafpride thought the price range was between $300 and $395. In Baltimore, only a few participants ventured a cost estimate, but most guessed the cost to be above the price of $180 for the Telecaption 3000. One participant thought the decoder sold for $900, as this was the price cited in the National Catalogue House for the Deaf in Chicago, but it was unclear whether she was referring to the Telecaption decoder or to a VCR with a built-in decoder.

In the parent group of non-decoder owners, many had no idea about the cost of decoders, and, when asked to estimate its price, provided figures ranging from $150 to $1,000. The majority of parents assumed the cost was over $300. Some of these estimates were based on the cost of purchases of other assistive devices.

While the hard of hearing had a slightly better perception of decoder price, they also offered cost estimates above the current selling price. When informed about the actual price of the TeleCaption 3000, one participant commented, "I thought it was more and therefore hadn't considered buying one." Respondents' misperceptions of price could therefore act as a deterrent to decoder purchase.

Lack of knowledge about where to purchase decoders was another factor inhibiting their purchase by non-owners. Again, members of the deaf groups appeared to have the least information about where decoders could be purchased. Over two-fifths of the Baltimore participants and almost half of the D.C. participants did not know where to purchase a decoder. Several Baltimore participants knew of a deaf man who sells decoders but indicated that they did not trust him. One Baltimore woman indicated that it could be purchased through the National Catalogue House for the Deaf in Chicago. Among the D.C. participants, several were vague about where an individual could buy decoders. Some thought they could be purchased only in Virginia or Silver Spring, MD,

although they did not mention where, and almost half wished they could be purchased in D.C. One person mentioned a VCR store and another cited Potomac Technologies, Inc., in Rockville, MD, which sells a number of devices for the hearing impaired. No one in either group mentioned Sears, Roebuck, and Company, Inc.

In contrast with the deaf groups, many members of the hard-of-hearing groups did not know exactly where to purchase the decoder but did know whom they should contact to get information about decoder purchase. Many people suggested calling hard-of-hearing organizations such as Self Help for the Hard of Hearing or the Washington Area Group for the Hard of Hearing. Others suggested calling electronic stores such as Radio Shack or stores specializing in assistive devices for the hard of hearing. Parents also suggested purchasing decoders through electronic outlets such as Radio Shack and Circuit City.

It is important to note that even if persons know who to contact to get information about where to purchase decoders, the device is not always easy to find. An example was provided by one parent owner who suggested that her mother, who lives in New York City, purchase the decoder for her hard-of-hearing father. Since her mother had no idea where to buy the decoder, the participant in the group suggested that she contact a hearing aid dealership for a referral. The mother made several inquiries and found that they wanted $500 for the decoder. The participant then purchased one in Washington for $189 or $200 and brought it up to her parents. Her conclusion was that "the Washington area was not representative of the rest of the country. There are more deaf people here, the information sources are here, and NCI is located here, so we are on a local mailing list for (decoders)."

In summary, knowledge about closed-captioned decoders does not appear to be as widespread in the deaf and hard-of-hearing communities as would be expected. Many participants in the focus groups were uninformed about captioning and decoders, and many who knew about the decoder lacked adequate information about price and place of purchase to make a decision to purchase the product. However, other factors, in addition to lack of knowledge, also appear to be associated with people's decisions not to purchase a decoder. These include people's perceptions of their hearing ability and the use of other techniques to enhance understanding of television broadcasts.

- **MANY HARD-OF-HEARING PEOPLE BELIEVE THEIR HEARING HAS NOT DETERIORATED SUFFICIENTLY TO WARRANT THE PURCHASE OF A DECODER. BOTH THE DEAF AND HARD-OF-HEARING RELY ON THEIR RESIDUAL HEARING AND ON LIPREADING TO ENHANCE THEIR UNDERSTANDING OF TELEVISION.**

In addition to lack of knowledge about decoders, one of the greatest deterrents to the purchase of decoders among the hard of

hearing is their perception that their hearing loss has not been so great as to warrant its purchase. Even among current owners, the vast majority of participants in the focus groups indicated that they had been reluctant to purchase the decoder because they believed their hearing had not deteriorated sufficiently to require the device. Comments frequently voiced in the focus groups included:

> "I didn't think I needed (a decoder)."
>
> "I had trouble admitting that it was a real problem because my hearing loss came very late and it takes you awhile when it comes that late to admit that you have a problem."
>
> "I was afraid I would become dependent on (the decoder) and lose my residual hearing skills."
>
> "I waited a long time. I'd say three years after I heard about it. And I think that my fiance sensed a chink in the armor and he just went out and bought it."
>
> "I have resisted every help that I have. Starting with my hearing aids, that took 16 years. Next came the lights to help me in the house. That took a couple of years. The same with captioning. And right now I'm resisting an alarm clock device."

A similar reluctance to purchase another sensory assistive device was also voiced by non-owners of decoders. Many simply felt that their hearing was not poor enough to warrant the purchase of a decoder. Participants in the focus group indicated that they would rely on their hearing first and would purchase the decoder only when they could no longer rely on speech for understanding television.

Reluctance to purchase a decoder because of the desire to rely on existing hearing was not as great among parent non-owners -- only two parents expressed such reluctance -- but the comments of these parents was consistent with those expressed by members of the deaf and hard-of-hearing groups. One parent with two hearing-impaired children, one of whom had severe to profound hearing loss and the other a moderate to severe loss, believed that his children would not need a decoder because they understood a sufficient amount of television. Another commented that using the decoder would be a stigma that would set her daughter apart from her hearing friends.

In addition to not perceiving their hearing loss to be great enough to warrant the purchase of a decoder, many hearing-impaired people also rely on other techniques to compensate for the loss and enhance their understanding of television. Both the deaf and hard of hearing rely on lipreading and assistance from

family members or companions to assist them in following television programs. Several owners of decoders in the hard-of-hearing group indicated that they liked to leave the sound on their televisions and watch the captions at the same time. They used the hearing aids to help them pick up missing dialogue when the captions were skimpy or there were gaps in the captions.

Neither lipreading nor assistance from others, however, appeared to be a satisfactory technique in enhancing their understanding of television. More than half of the deaf participants who received assistance indicated that the person helping them complained about providing that help. Complaints were also voiced by the family members of the hard of hearing who were providing assistance.

Other techniques are also used by hard-of-hearing individuals to enhance television viewing that may deter them from purchasing a decoder. Many turned up the volume on their television sets; several used different listening devices, in addition to their hearing aids. Included among the devices were remote TV band radios, audio loops, and an infra-red system. In the case of an audio loop, a microphone is placed on the speaker of the TV, or, if there is a jack on the television, direct audio output is obtained from the television. The sound is transmitted by air or by a wire and is picked up by the T-switch on the individual's hearing aid. The infra-red system uses light waves to transmit sound. A device is placed on top of the television and transmits the sound to earphones.

Even hard-of-hearing decoder owners, prior to their purchase of the decoder, employed other assistive listening devices to enhance television viewing. A couple of owners first used an FM listening device. This device has a microphone situated next to the sound source. The sound is transmitted directly to headphones, or, in the case of hearing aids, directly to the ear. Others used a remote TV band which magnifies the sound of the television, which comes through either an ear plug or a device held close to the head. When these devices no longer proved satisfactory, they turned to the decoder.

Hard-of-hearing decoder owners, unlike deaf owners, chose not to rely on the decoder all the time. Decoder use varies with the program and the individual's ability to comprehend a program. Participants in the focus groups expressed a preference for viewing television without the decoder if there was a show where one person was speaking and that person was enunciating clearly. Like the non-owner group, the owner group wanted to continue to utilize their residual hearing. They did not want to lose their lipreading skills or become too dependent on captioning for understanding television.

In contrast with hard-of-hearing adults, hearing-impaired children tend to use fewer assistive devices to enhance television. Only three parents in the focus groups -- two owners and one non-owner -- had tried an assistive listening device. The parent owners introduced their children to audio loops, but in one case it did not help much, and in the other the child refused to use it. The non-owner tried an FM system but indicated that his child found it noisy and was unable to pick out distinct words.

In summary, the perception that the degree of hearing loss is not great enough to require the purchase of a decoder appears to be a major deterrent to the purchase of the product by potential users. This perception, coupled with the use of alternative assistive listening devices, may help account for the fact that a relatively small proportion of the market for decoders has been tapped -- at least among the hard of hearing. Many people in this group want to continue to utilize their residual hearing rather than become dependent on captioning.

A final factor that appears to be a deterrent to purchasing a decoder -- to at least some individuals -- is the price of the product. The focus groups produced a variety of opinions about the cost of the decoder, including the view among some decoder owners that the current price of the TeleCaption 3000 at $179.99 was reasonable or low. However, the focus groups also support the conclusion that:

- **THE COST OF DECODERS APPEARS TO ACT AS A DETERRENT TO PURCHASE BY HARD-OF-HEARING PEOPLE -- PARTICULARLY PEOPLE WHO DO NOT PERCEIVE THEIR HEARING LOSS TO BE ESPECIALLY SEVERE. DEAF PEOPLE FROM LOW-INCOME BACKGROUNDS ALSO INDICATE THAT THE COST OF THE DECODER ACTS AS A DETERRENT TO PURCHASE.**

Although reactions to the price of the decoder were diverse in almost all of the focus groups, numerous people in the hard-of-hearing groups indicated that the price of the decoder deterred them from purchasing the product. Several non-owners who still had some residual hearing thought that the cost was more than it was worth at the present time, particularly since the programs they were interested in weren't captioned. As one participant summed it up, "I don't think I would get $180 worth of benefit for that (the decoder)."

Even among the owners of decoders, several focus group participants indicated that price was a consideration in their purchase. One participant commented, "I had to think twice before I go out and plunk down $200 for something that will benefit only me." A number of people waited more than six months after viewing the decoder before purchasing it because they felt the device was too expensive. Others also felt that, as with

other electronics equipment on the market, the price would eventually come down.

Several people found ways to get the decoder for less than the retail price of $180. One participant who considered the price to be prohibitive for some people launched a drive to purchase multiple decoders through the Northern Virginia SHHH. She was able to purchase the decoder at a group price of $150, which she felt was "much more reasonable." Other people also bought the TeleCaption II decoder through special promotionals where the purchase price was $150. Their decision to buy to decoder was based on a savings of about $30.

In addition to the hard of hearing who felt they did not need the decoder immediately, low-income people in the deaf groups also expressed the concern that the price of the decoder was too high. It is difficult to assess, however, what price people would consider reasonable to spend on the decoder. In the Baltimore group, all of the participants felt that $10 would be reasonable and about half were willing to spend up to $25. In the Washington group, about half of the participants were willing to pay up to $100 for the decoder. Some thought that installment buying would be a good way to pay for the decoder since they could spread the payment over a period of time.

Several other interesting observations about price also emerged from the focus groups with lower-income deaf people. One was that the Federal Government should provide the decoders free of charge. This was particularly true of the Baltimore group where many people felt that the deaf have to purchase so many other things that it should be the government's responsibility to supply them with decoders. People indicated that rent and other bills took priority and that people on SSI and welfare simply did not have sufficient money to purchase the decoder. It should be noted, however, that several of these people lived in homes with two to three televisions and VCRs, so it was unclear how much of their opinions were based on their inability to afford a decoder, as opposed to there being other priorities on which they chose to spend their money.

In contrast with the hard of hearing who still have residual hearing ability and the low-income deaf, parents of hearing-impaired children generally thought the TeleCaption 3000 was reasonably priced. They had anticipated a higher price based on the cost of other assistive devices they had purchased. However, in both the owner and non-owner groups, there were qualifications to this view. Several owners expressed the view that $150 would be a better price for the decoder since the current price would be too expensive for them to purchase a second decoder. As one parent indicated, "I just can't afford it right now. When you have one, it's not a priority to have two or three. I think if

it were more reasonable, I'd be more apt to purchase a second one."

In addition, several non-owner parents were not prepared to pay even $180 for the decoder. One parent commented that he was not ready to budget the $180 because other things took priority. Even among parents who knew about decoders before the focus group and were interested in purchasing one, other priorities often got in the way and the purchase of the decoder was deferred.

In summary, the price of decoders appears to be a deterrent to their purchase in two key segments of the population: the hard-of-hearing who still rely on residual hearing to watch television and the low-income deaf. Although generally regarded as "reasonable" by parents of hearing-impaired children, the price of $180 also appears to act as a deterrent to the purchase of a second decoder by people who already own a decoder. It is not clear, however, from the focus groups what price would be more acceptable to people who were reluctant to purchase a decoder, nor how much different reductions in price would affect the demand for the product.

Factors that Facilitate the Purchase of Decoders

While several factors appear to inhibit the purchase of closed-captioned decoders among people who do not currently own them, other factors may facilitate the purchase of decoders by non-owners or the purchase of a second (or new) decoder by current owners of decoders. Family influence appears to be a factor for the first group and technology for the second.

Hearing-impaired people often seek assistance from hearing family members in understanding television. Frequently this creates frustrations, as the constant interruptions cause the hearing person to lose concentration and decrease his or her enjoyment of television. As one parent-owner commented, "I watch television more now than when we didn't have the decoder because I just could not stand watching with her, and having her ask me all the time, 'What's going on, what's going on?' By the time I told her what one person said, I would miss out on what the next person said." Based on these and similar statements, it is apparent that:

- **FAMILY MEMBERS PLAY A MAJOR ROLE IN INFLUENCING THE PURCHASE OF DECODERS AMONG THE HARD OF HEARING.**

The focus groups found that pressure from family members often leads hard-of-hearing people to purchase a decoder. In at least two cases, family members insisted that their hearing- impaired spouses purchase the decoder. In one situation, the hearing

spouse realized that his wife was bluffing about her ability to understand television. She was forced to admit that she was missing too much on television even using her hearing aids and lipreading. In the other situation, the hearing spouse found television "no longer any fun" and insisted his hearing-impaired wife purchase the decoder.

In addition to pressuring the hearing-impaired person to buy a decoder for him or herself, relatives often purchase a decoder as a gift for the family member. Several children of participants in the focus groups purchased the decoder for their parents. One woman who had intended to purchase the decoder herself received it as a birthday present from her children. Another woman also received it as a gift from children who "seem to be alerted to all the new gadgets as far as hard as hard-of-hearing and deaf people are concerned. Each time there is a gadget on the market, it appears on my doorstep."

In addition to family members, other decoder owners also influence hard-of-hearing people to purchase a decoder. One participant in the focus group related how his grandfather borrowed the decoder and showed it to his friends. They were excited about the device and wanted more information about where to buy it. Another participant in the parent group, who had a hearing-impaired child, indicated that she bought the decoder for her father and father-in-law, each of whom had mild hearing losses due to aging. She said, "It makes it more enjoyable for my family to visit them because my child can use the decoder that is there."

While family members appear to be a major influence on people who are hard of hearing to purchase a decoder, discussions with the deaf population indicated that family members played only a minor role in influencing the purchase decision. In some cases, the deaf who needed assistance were ignored by their families, and in only two cases did family members purchase decoders as a gift for a deaf spouse or child. One of these involved a woman living in the "middle of nowhere" in Texas who received a decoder as a surprise Christmas gift from her hearing-impaired husband when they moved to the Washington area. The other was also received as a Christmas present from hearing parents.

In summary, the focus groups suggest that while it is important for hearing-impaired people to be aware of decoders in order to be able to purchase the product themselves, relatives of the population are also an appropriate audience for marketing efforts -- particularly for the hard-of-hearing population. Hearing relatives are often more perceptive about the need for a decoder than the hearing-impaired person and willing to purchase the decoder as a gift for a family member with a hearing impairment.

Although family influence appears to be one factor that may have a great deal of influence on decoder purchase, the state of decoder technology may also have a bearing on people's decisions to purchase -- or not to purchase -- a decoder. The focus groups suggest that:

- **IMPROVEMENTS IN DECODER TECHNOLOGY MAY INFLUENCE THE DECISION OF CURRENT OWNERS TO PURCHASE A SECOND DECODER, BUT ARE A MUCH LESS IMPORTANT FACTOR IN THE DECISION OF NON-OWNERS TO PURCHASE A FIRST DECODER.**

Advances in decoder technology are of greater concern to current owners of decoders than non-owners, at least in part because owners are much more cognizant of the features of decoders than the non-owner population. In commenting on the TeleCaption 3000, one non-owner parent summed up the feeling for the group when she said, "For a group of people who may not know, never being exposed to one, it's okay." However, even in the hard-of-hearing group, several members who were more knowledgeable about decoders indicated that several technological changes might influence their decision to purchase a decoder.

Features suggested by deaf and hard-of-hearing decoder owners that might encourage them to purchase another decoder included an integrated device that would combine VCR and decoder, decoder and cable, or VCR, decoder, and television. (It should be noted, however, that not everyone was in favor of an integrated system because of the concerns about repairs.) In addition, a majority of owners wanted a simplified decoder hook-up. A number of deaf participants suggested a simple device shaped like a block that could be attached to the back of the television. It would have three wires running from the block to the television, VCR, and cable wires. Not only would this alleviate the hook-up problem, but it would also solve some of the difficulties encountered hooking up cable television to their TeleCaption II.

Other technological features favored by decoder owners included a decoder that would be integrated into the cable box and a decoder that would be even lighter in weight than the current TeleCaption 3000 model. The hard-of-hearing were particularly interested in a lightweight, compact decoder that they could carry with them on business trips. Parents also voiced a similar desire so that they could use the decoder when they traveled with their children. As one parent indicated, "Whenever we go to a hotel, my [illegible] is so completely cut off from TV. He's so frustrated. A lighter weight decoder that we could take with us would help solve this problem."

Although non-owners of decoders were much less knowledgeable and interested in technological features, several participants in the focus groups who were better informed about them suggested a number of features that might encourage their purchase of a

decoder. One was the integrated system preferred by several owners of decoders in which the TV, VCR, and decoder were included in one unit. Another was a decoder built into the television -- with a maximum cost of $500 to $600. Still another, suggested by one participant who was disturbed with the lack of synchronization of some captioned programs, was the use of voice-to-print technology as the method of perfecting program captioning.

Finally, several participants suggested a simplified system of hooking up the decoder -- possibly in response to the perception that the instructions in the installation book were "overwhelming." Several owners thought the diagrams and the use of many electrical terms in the booklet were confusing; non-owners who reviewed the instructions during the focus groups also indicated that the instructions were difficult to follow.

In summary, it would appear that while decoder technology -- or improvements in the technology -- would not be the key factor in influencing people's decisions to purchase -- or not to purchase -- a decoder, some changes in the technology might be of interest to current owners or to potential buyers.

Simplifying the instructions for installation was favored by most respondents in the focus groups, but changes in the technology such as building the decoder into the television produced diverse reactions. Some respondents favored this type of technological change, while others thought that problems in repairing a unit with all features built in would offset the advantages of this decoder feature.

Factors Unrelated to Decoder Purchase

The focus groups explored a number of other factors that were expected to influence people's decisions to purchase -- or not to purchase -- a closed-captioned decoder. These included the number of programs on television that were closed-captioned and the quality of television captioning. Neither of these factors emerged from the focus groups as ones which would specifically influence a decision about purchase, but participants' comments in both of these areas are important to report since they reflect people's perceptions about both the quantity and quality of captioning.

Concerning the number of programs that are currently captioned, the majority of decoder owners generally felt that there was sufficient programming available, but that it would be ideal if all programs were closed-captioned. Several areas of programming were specifically singled out for mention. Not surprisingly, these included such public information programs as the

"McNeil-Lehrer Report," which could be an important source of information for the hearing impaired. In addition to news programs, several respondents felt there was insufficient programming of daytime programs and late night movies. The lack of daytime programs was also considered a deficiency by parent non-owners whose children often turned on the television after school before starting their homework. Because of the lack of captioning, they had difficulty understanding many of these programs.

One other area of programming lacking captioning was mentioned by parents of hearing-impaired children who owned decoders, namely Disney movies and productions appearing on the Disney Cable Channel. Several parents felt that there should be an emphasis on captioning programs that support the hearing-impaired person's entrance into mainstream culture. As one parent stated, "Walt Disney is part of our culture and hearing-impaired children have a right to that culture." The parents believed that the situation was further exacerbated because the older Disney videos are not captioned either. Other parents were disappointed that some of the classic children's movies on television were not captioned, but they did not list specific programs.

Concerning the quality of captioning, the reactions to captioning in all of the focus groups were generally quite favorable. The following comments by participants in the hard-of-hearing group who viewed captions for the first time typify the reactions to the captions:

> "As far as I'm concerned, it would be more comfortable with the captioning than without."
>
> "I think it would be a big help, but apparently you have to have good vision to go along with it."
>
> "I thought it was wonderful and the words were very distinct with the black."
>
> "I think it's fantastic and marvelous. I don't think I would have picked up all the information without it."

A number of problems were, however, identified by participants in all of the focus groups which, if corrected, could greatly improve people's enjoyment of television with captioning. One major problem was speed. About one-third of the deaf viewers thought that the words went by too quickly and that they did not have sufficient time to read everything. As one participant in the deaf group stated, "I can't see what they say when it goes too fast. I miss the words."

Another problem was the lack of synchronization with the speech, a problem of particular concern to hard-of-hearing people

watching a closed-captioned documentary. As one participant observed:

> "I find it very confusing when the captioning and the sound do not agree. I'm relying on one function which is hearing, then I'm being switched by captioning to another function, which is visual, and if the two do not mesh or match, then I get confused about whether to watch the visual or rely on the hearing. Now, maybe after a while, if this went on day after day, we would get used to it and it would merge, so that the confusion I'm feeling about this would not be apparent. But at this point I find it somewhat disturbing."

Another comment also reflects the problem of the lack of synchronization between the visual image and the captions:

> "I sort of had the feeling I was losing confidence in the speaker when the captioning did not agree with the sound. And then you're left with, 'Who do you trust -- the captioning or the sound?'"

A third problem with the captions cited by both deaf and hard-of-hearing participants was the placement of the captions on the television screen. One such placement was over a person's face, which prevented people from lipreading. Another was over an open caption, such as the name of a person interviewed on a news story which made it impossible to identify the person speaking. In one situation, the hearing spouse would turn off the captions in order to identify the speaker, but in doing so, his hard-of-hearing wife would then miss some of the dialogue.

Still another problem cited by both the deaf and the hard-of-hearing were the omissions and paraphrasing they noted in the captioning. Several people said they found this particularly confusing when they lip-read because they are uncertain that the captioning is providing all of the information. The following comments underscore this problem:

> "I was a little bit upset when I noticed that when I read, and I read the lips, and then it would come up that it was something more than what the caption said. I'm not sure if the captions were telling the whole picture of what it was about. Misleading, in my thinking."

> "My (hearing) mother said the picture and the captions were not the same. They were different. And my mother said, 'Maybe they think you're dumb because the speaking was a lot faster and the sentences were simple.' I was really disgusted about that."

> "I lip-read myself and I saw that it was more vocabulary. There were more colorful words that were being said, and the

ideas were not exactly the same, so it was disappointing to me."

"I guess I'm annoyed by the paraphrasing, dropping off of things. I was thinking of 'Moonlighting,' where they're only captioning a third of the stuff, I think. Because I know my roommate would be over there laughing, and I'd be going, 'What's going on?' Because the captions didn't reflect it at all."

Finally, several respondents mentioned problems with the speed of real-time captioning. With real-time captioning, the words often appeared too quickly on the screen and were so misspelled that the viewer could not follow what was being said. One participant referred to these captions as Egyptian hieroglyphics. Comments such as the following were voiced:

"You try to translate sometimes when you get this gibberish, and, you can't use your own hearing for back-up because the person is either speaking with an accent or off camera and you have no idea what they're saying."

"The captioned news -- it comes up fast and the spelling's terrible. I have to guess. It's not fun to watch."

For hard-of-hearing individuals with residual hearing, the lack of synchronization of real-time captioning becomes confusing. As one participant commented, "It is at least 10 to 15 seconds behind, and, if you have any type of hearing aid, and if you hear something and try to read the closed captioning at the same time, you lose almost the whole gist of what is going on."

In summary, most respondents were pleased with the quality of captioning and felt that captioning improved their enjoyment of television. However, some problems with the technology limited the ability of deaf and hearing-impaired people to fully enjoy television. Correction of these problems, while not likely to increase the sale of decoders to non-owners nor the sale of second decoders to current owners, could result in greater consumer satisfaction with the product. However, it is important to note that some problems may be more difficult to correct. For example, the speed of captions and synchronization often work at cross purposes. If the speed of the caption is reduced to enhance the comprehension of the deaf viewers, the content is altered. This results in even poorer synchronization.

CHAPTER V: FINDINGS: SUPPLY OF DECODERS

In the preceding chapters, we provided estimates of the market for closed-captioned decoders and an analysis of factors that appear to be associated with decisions to purchase -- or not to purchase -- a decoder. These analyses were designed to provide an assessment of the potential demand for decoders. For a demand analysis to be complete, however, at least some consideration must be given to supply factors. That is the purpose of this chapter. In the discussion that follows, we briefly review developments in the production of closed-captioned decoders, patterns of decoder distribution, and an analysis of decoder sales, based on progress reports filed by the National Captioning Institute (NCI) with the Department of Education and conversations with NCI's Director of Marketing.

Production of Closed-Captioned Decoders

The production of closed-captioned decoders began during the late 1970s with the development by Texas Instruments, Inc. of the integrated circuitry necessary for the decoding process and the manufacture by Sanyo of the decoder adapters. The equipment which became available commercially in 1980, included two units: an adapter unit which attached to the antenna terminals of any existing TV set and a 19-inch color television set with built-in decoder circuitry. The adapter unit, commercially known as TeleCaption I, cost approximately $280; the television set with the built-in decoding circuitry sold for approximately $530.

In October 1985, the Federal Government began subsidizing the production of 50,000 units of a new second-generation decoder, TeleCaption II. This unit, which became available in January 1986, sold for $200, a 40 percent reduction in price over the previous unit. In October 1987, NCI signed a new cooperative agreement with the U.S. Department of Education which provided a subsidy for the production of a third-generation decoder, the TeleCaption 3000. This unit, with the module produced by Nuvatec, a Chicago electronics company, became commercially available in June 1988. It currently sells for $180 -- a 10 percent reduction in price from the TeleCaption II.

The cost of producing the TeleCaption 3000 is currently estimated to be approximately $145 per unit. With the Federal subsidy of

approximately $30 per module, production costs are about $115 per unit. This cost is considerably lower than the cost of both the TeleCaption I and the TeleCaption II.

Technological advances were primarily responsible for the reduction in production costs from the first-generation to the second-generation decoder. Changes in some of the features of the decoder, however, helped reduce production costs between the TeleCaption II and the TeleCaption 3000. Eliminated from the TeleCaption 3000 was a cable-compatible tuner and Audio/Video input/output ports to and from the VCR. The first feature was eliminated because NCI felt that a cable-compatible tuner was redundant since approximately 80 percent of the population who have cable have a cable converter. The elimination of the audio/video ports, in addition to cutting costs, simplified decoder hook-up.

Although some features were eliminated from the TeleCaption 3000, technological developments also permitted the production of a lighter and more portable unit at a lower cost. The newest model decoder, with a weight of about 4 1/4 pounds, is about one-third the weight of the TeleCaption I and is much more compact in size than earlier models of the decoder.

Distribution of Decoders

When the TeleCaption I was first introduced in 1980, Sears Roebuck & Company had the exclusive rights to sell the decoder. Today, more than 900 stores carry the TeleCaption 3000 nationwide. Sears' exclusivity ended in 1982 when decoder sales did not reach their projected level and NCI became involved in expanding the distribution network. The obvious distributor became the small specialty stores catering to the deaf population. When the TeleCaption II was introduced, NCI's initial sales plan was to sell the decoder both through retailers and directly. However, authorization for direct sales was not provided until the product was on the market for four or five months. By this time, NCI recognized that direct sales was not a good strategy since it led to competition with its own retailers. NCI therefore shifted strategies, utilizing retailers as their primary distributors.

When sales of the TeleCaption II tapered off again at the end of 1986, NCI enhanced its efforts to increase distribution and bring in the larger retailers. Part of this effort involved the use of direct sales in retail outlets, rather than use of catalogues alone to make people aware of the product. Distribution of the decoder was expanded to include stores specializing in electronics such as Erol's Video Stores, Lechmere, and Wall-to-Wall Sound on the East Coast, retailers such as Highland

in the Midwest and Texas, Long's Electronics in the South, Filco in Sacramento, and Service Merchandise Stores in 36 states. In addition, J.C. Penney, the AT&T Special Needs Center and Service Merchandise began to feature the decoder in their catalogues.

Sears continues to be the largest retailer, selling the decoder in its catalogues, as well as in 113 of its retail stores. At Sears' national headquarters, the national buyer determines which catalogues will feature the decoder, but not which retail stores will display the decoder for sale in the store. This decision is left to the regional merchandise managers, based on their assessment of the demand for the product. As a result, not all Sears' stores carry the decoder.

Many independent businesses owned by hearing-impaired people continue to sell the decoder. Other organizations within the hearing-impaired community such as the National Association for the Deaf (NAD) and Telecommunications for the Deaf, Inc. also sell the decoder -- the former organization for members only, the latter to all interested buyers.

Sears tends to set the price for the decoder, selling it for $180, and most retailers follow that lead. Erol's, for example, sells the TeleCaption 3000 for $180, but offers club members a 10 percent discount. Deaf organizations may also offer discounts to their members. At the end of 1987, for example, a manufacturer rebate on the TeleCaption II was given to persons who purchased the decoder from NCI authorized dealers, not through NCI directly. More recently NCI discounted the price of the TeleCaption 3000 to members of the Northern Virginia Chapter of SHHH. The Chapter received the same type of price break that dealers would receive for a volume purchase. Approximately 30 Chapter members purchased the decoder for $150. NCI itself, while not a major retailer of decoders, also continues to sell them in small numbers to people who contact the organization directly.

Market Strategies for the Decoder

In addition to relying on large national retailers such as Sears and electronics stores such as Erol's and Highland Super Stores to sell the decoder, NCI engages in other activities to market the product. These activities include:

- Placing advertisements in major hearing-impaired publications such as the NAD Broadcaster, Silent News, The Voice, and SHH
- Exhibiting the decoder at major conventions such as NAD, Alexander Graham Bell, SHHH, the National Conference on

Deaf and Hard-of-Hearing People, the Video Software Dealers' Association, and the Consumer Electronic Show;

- Seeking endorsements for captioning from organizations serving the hearing-impaired community, including the elderly;

- Sending direct mail literature introducing the TeleCaption 3000 to current decoder owners; and

- Establishing two "800 numbers" to provide consumers with information on the decoder.

NCI acknowledges, however, that with only a relatively small budget for marketing, additional efforts are needed to market the decoder more effectively in the hearing-impaired community.

Decoder Sales

Closed-captioned decoders have been marketed commercially since 1980. However, a review of sales records for the decoder provided by NCI to the Department of Education indicates that the number of decoders sold since that time represents only a small fraction of the potential market for the product. The following points about decoder sales emerged from our analysis of these sales records.

- **IN THE PERIOD FROM 1980 THROUGH 1988, ABOUT 208,000 CLOSED-CAPTIONED DECODERS WERE SOLD. THIS FIGURE IS WELL BELOW THE INITIAL PROJECTIONS OF 100,000 SALES PER YEAR.**

- **THE INTRODUCTION OF EACH NEW GENERATION OF DECODER HAS GENERALLY BEEN FOLLOWED BY A BURST IN SALES. AFTER A FEW MONTHS SALES APPEAR TO DROP OFF TO LOWER LEVELS.**

Although the potential market for closed-captioned decoders is estimated to be several million people, the number of decoders sold has been well below that level. When the decoder was first introduced in 1980, initial sales estimates were for about 100,000 per year. Such volume in sales, however, never materialized.

Based on our analysis of sales records, we estimate that a total of about 208,000 decoders have been sold between 1980, when the first-generation decoder, TeleCaption I, was first introduced in 1980, and September 1988.. These figures include 100,000 sales of the TeleCaption I between 1980 and mid-1985, about 80,000 sales of the TeleCaption II between January 1986 and October 1988, and about 28,000 sales of the TeleCaption 3000, between

June and October 1988. A more detailed discussion of decoder sales is provided below.

The first-generation decoder, the TeleCaption I, was first introduced in 1980 and was on the market through mid-1985. Despite projected sales of about 100,000 per year, it took almost five years for the initial production of 100,000 units to be depleted. A combination of factors is cited for the poor sale of the TeleCaption I. These include: the unstable state of the economy during the early 1980s; only about 15 hours of closed-captioned programming per week; the lack of a captioned prime-time national news program, which was a top priority among the hearing impaired; and the expectation among potential purchasers that, as with other technology, prices would eventually decline. There is evidence from the focus groups that this last factor still appears to be influencing people's decisions to defer purchase of a decoder.

Following the depletion of the supply of the TeleCaption Is, the second-generation decoder, TeleCaption II, was introduced in January 1986. About 50,000 TeleCaption IIs were produced in preparation for the introduction of the new decoder on the market. Within three months, however, nearly 36,000 TeleCaption IIs were ordered and John Ball, President of NCI, testified before Congress in May 1986 that revised sales projections were for sales of 100,000 units of the TeleCaption II in 1986. The Federal Government agreed to subsidize an additional 33,000 decoders (above the original 50,000 TeleCaption IIs) in order to meet the demand for the product. Sales, however, slackened again towards the end of 1986 and have remained below the level attained when the TeleCaption II was first introduced.

As of August 1988, NCI sales records indicate that of the 83,000 TeleCaption IIs produced under the 1985 and 1986 cooperative agreements, approximately 2,850 units remain to be sold. Excluding the 36,000 units initially ordered, approximately 44,150 units were sold over the 26-month period between April 1986 and May 1988 -- an average of about 1700 per month. An above-average number of units was sold in February and March 1988, when 3,177 and 2,293 units were sold respectively, but in April, sales again dropped dramatically, with the shift in production efforts to the new TeleCaption 3000.

Between June and September, 1988, TeleCaption IIs were unavailable, but nearly 24,000 TeleCaption 3000s were ordered during that period. Although this figure is slightly below initial orders for the TeleCaption II, sales seem to be relatively high when compared with the monthly sales average for the second-generation decoder. If sales continue at this rate, they could reach about 42,000 by the end of the year -- even as high as 45,000 if holiday sales provide for a strong fourth quarter. However, sales for October 1988 indicate a slackening

of sales again, which is consistent with sales patterns for the TeleCaption II, i.e., an initial burst in sales after the introduction of the product followed by a lag in sales subsequently. It is therefore difficult to assess how quickly the remaining supply of TeleCaption IIs and the new supply of TeleCaption 3000s will be sold.

Sales patterns of decoders have varied considerably over the last five years, so it is difficult to establish an average number of monthly sales for the TeleCaption II and a projected average for the TeleCaption 3000. However, it does appear that when a new generation of decoder becomes commercially available, there is a burst in sales. This occurred with the introduction of the TeleCaption II in January 1986 and again with the TeleCaption 3000 in June 1988. Several factors may account for this pattern of decoder sales.

The initial burst in sales for the TeleCaption II in January 1986 may have been due to a combination of circumstances that could not be sustained over time. One such factor may have been the pent-up demand for decoders following the depletion of the supply of TeleCaption Is in mid-1985. (There was a period between July 1985 and January 1986 when no decoders were available because the supply of TeleCaption Is had been depleted and the TeleCaption II had not yet been introduced.) Other factors include the publicity surrounding the introduction of the new unit and the 40 percent reduction in price over the previous model. With the satisfaction of the pent-up demand early in 1986, sales flattened out and remained at lower levels from mid-1986 through mid-1988.

In summary, sales of closed-captioned decoders represent only a small fraction of the potential market for the product. Estimates of the deaf from the 1986 NHIS are approximately 1.6 million and of the bilaterally hearing-impaired approximately 9.5 million, but only about 208,000 decoders have been sold since their introduction on the market in 1980. The introduction of each new generation of decoders has been followed by an initial burst in sales, but then sales have leveled off after the new model has been on the market for a short time. Additional marketing efforts in the hearing-impaired community -- or the expansion of marketing efforts to other segments of the population -- may be required if higher levels of decoder sales are going to be sustained over a longer period of time.

CHAPTER VI: CONCLUSIONS

The combination of research methodologies employed in this study -- the literature review, the reanalysis of the 1986 Health Interview Survey, the focus group discussions with selected target populations, and the interviews with staff at the National Captioning Institute and program staff at the Department of Education -- resulted in several significant findings about the demand for closed-captioned television decoders. These findings focus on the potential market for decoders, the factors affecting decoder purchase, and the production and sale of decoders.

Although the study findings were based on the best existing information, we recognize the limitations of the methodologies used to produce them. The NHIS, which was the primary data source to estimate both the size of the hearing-impaired population and the market for decoders, does not collect data which differentiates levels of hearing impairment. The focus groups, held in the Washington Metropolitan area, do not contain a representative sample of the deaf population nationwide.

Because of these limitations, the current research may not be sufficient to assess fully the potential market for closed-captioned decoders or to offer broad generalizations about factors that influence or deter decoder purchase. However, the research did produce several significant findings about the demand for closed-captioned decoders. We therefore conclude that certain actions, if undertaken, will influence decoder purchase. These actions include the following:

- Expand knowledge of decoders through a public awareness campaign;
- Improve technology to include such innovations as an integrated system, simplified hook-up, multiple models, and a dual system with assistive listening devices.

In addition, to enhance our understanding of the market for decoders, we also conclude that additional research is required. The types of research activities and the institutions or agencies responsible for them will be discussed below.

Activities to Influence Decoder Purchase

The focus group identified several factors that appear to influence decisions about the purchase of a decoder. A number of factors, including lack of knowledge about decoders, acted as deterrents to decoder purchase. Based on these findings, we conclude that the following actions could influence decoder purchase and possibly expand the market for decoders.

- **EXPAND KNOWLEDGE OF DECODERS THROUGH A PUBLIC AWARENESS CAMPAIGN.**

One of the key findings of the focus groups was that the hearing-impaired population lacked information on the capabilities of decoders, their cost and their place of purchase. This lack of knowledge was a major deterrent to purchase, particularly among the low income deaf. Publicizing decoders through written materials may not be effective for all groups however, because of marginal literacy skills among significant portions of the deaf community. We conclude that reaching this audience requires a public-awareness campaign that involves demonstrations of the decoder within the community at community centers, schools, libraries, local video rental stores, or local electronic retail stores.

Promotional campaigns must target relatives of the hearing impaired. Our study found that in several cases relatives were responsible for the purchase of the decoder. This means alerting the general population to the capabilities of the decoder as a way of expanding the market for the product. Some strategies for reaching relatives of the hearing impaired include:

- Providing brief information brochures to health care professionals for placement in their offices;
- Having retailers prominently display decoders;
- Educating retailers and service personnel on the operation of decoders;
- Providing brief public-service announcements on television followed by an 800 number to call for additional information; and
- Demonstrating equipment in public areas such as libraries and recreational centers.

In addition, it is necessary to enhance the role of school systems in providing parents with information about decoders for the hearing impaired. While special schools for the deaf do

educate the parents about decoders, our study found that this was not the case in schools were there were only a few hearing-impaired students. Information about decoders must be made available to local schools.

Itinerant and other special teachers for hearing-impaired students would provide one excellent avenue of information for both parents and students. In addition, schools often provide films or television programs for students. Since many films and educational programs are closed-captioned, viewing them on a television with a decoder adapter would facilitate the learning of the hearing-impaired students as well as acquaint the hearing student with the device.

If decoders prove to be an effective tool for enhancing reading skills of the learning-disabled and LEP students, then these populations must also be targeted to increase levels of awareness of closed-captioned television. The strategies discussed above can be employed to reach these populations as well.

o **IMPROVE TECHNOLOGY TO INCORPORATE RECOMMENDED INNOVATIONS.**

Our study indicated that several technological improvements may influence the decision of current decoder owners to purchase a second decoder. These include developing an integrated system which would be relatively compact and easy to operate, simplifying decoder hook-up so that the individual need not rely on a more "mechanical" person, and developing a portable unit, perhaps pocket size, to be used for travel.

In addition, diversifying the decoder to include a basic model and a model with "luxury" features would appeal to larger segments of the hearing-impaired population. Since cost was a deterrent to decoder purchase both for initial purchasers and for second-time buyers, it is necessary to provide a low-cost product. Persons on fixed incomes or who want a decoder for a second television would more likely purchase an inexpensive device. After experience with the basic model, however, the first-time buyer may even want to "trade up." Persons who have more disposable income and prefer the "loaded" model could choose one with a variety of features.

And finally, for the hard of hearing who are reluctant to use other sensory devices such as a telephone light or a TDD, a decoder with a built-in assistive listening device may be the perfect model. The hearing-impaired individual can then determine which system to use. If a program features a speaker with a foreign accent, or there is loud background music that interferes with their hearing, the individual can simply turn on the decoder. A dual system may be an excellent way of introducing the hard of hearing to the benefits of the decoder.

Research Activities

To gather more accurate and current information on the potential market for the decoders and on the hearing-impaired population in general, it is essential that various government agencies undertake additional data collection activities. These activities should focus on the following populations -- the hearing impaired, the learning disabled, people with limited proficiency in English, and adult beginning readers.

- **COLLECT DATA ON THE HEARING IMPAIRED THAT PROVIDES INFORMATION ON THE DEGREE OF HEARING LOSS.**

While there are several sources for estimating the prevalence of hearing impairment in the United States, there have been no recent surveys that provide data on the degree of hearing loss. Questions included in the annual survey conducted by the National Center for Health Statistics (NCHS) in their National Health Interview Survey provide information from respondents on deafness or other hearing trouble in one or both ears. Although this information enables us to determine whether individuals suffer from unilateral or bilateral hearing losses, we cannot differentiate the degree of hearing loss. The need for this information is twofold: to realistically assess the segment of the population that could most benefit from the decoder and other assistive devices and to develop specific strategies to increase their level of awareness about decoders.

We therefore conclude that the Gallaudet hearing scale included by NCHS in the 1971 and the 1977 NHIS should be included in the 1990 NHIS. This supplemental questionnaire will provide the required information on levels of hearing impairment based on respondents' self-evaluation of their ability to hear and understand speech through the ear alone.

- **CONDUCT RESEARCH STUDIES ON THE USE OF CLOSED-CAPTIONED DECODERS AS INSTRUCTIONAL TOOLS IN DEVELOPING READING SKILLS AMONG THE HEARING IMPAIRED.**

The reading levels of hearing-impaired students are well below that of the average hearing child. Studies have shown that reading comprehension achievement for the hearing impaired population develops slowly over the entire school-age range, leveling off during high school. According to Trybus and Karchmer, half the hearing impaired students aged 20 and younger read at less than a mid-fourth-grade level. The typical growth rate is very moderate for the average hearing-impaired student, approximating one-third of a grade equivalent change each year through the elementary and secondary grades.

Information on whether closed-captioned decoders are effective instructional tools to enhance reading skills for the hearing impaired is important for both parents and educators. Although NCI conducted some studies that suggested captioning enhances reading skills of hearing-impaired students, additional rigorous research is warranted. We conclude that the U.S. Department of Education, Office of Special Education and Rehabilitative Services (OSERS) should provide research support to institutions with trained researchers who have expertise in working with the hearing-impaired population. Such research should focus on the development of sight vocabulary, reading comprehension, and verbal learning. In addition, the extent of hearing loss, age, and current reading levels should be included into the analysis.

If the studies prove that decoders have a beneficial effect on the child's ability to read, they could serve as an incentive for parents and relatives of the hearing impaired to make decoder purchase a priority. People would see decoders both as a valuable educational tool and as a link to the world at large. The studies would also be an incentive for schools with few deaf children to request funds for decoder purchase. Decoders could then be used as a instructional tool by itinerant teachers of the deaf.

- **CONDUCT RESEARCH ON THE USE OF DECODERS AS INSTRUCTIONAL TOOLS FOR THE LEARNING DISABLED, PEOPLE WITH LIMITED PROFICIENCY IN ENGLISH, AND THE ADULT BEGINNING READER.**

There are several other target populations that could potentially benefit from the use of the decoder if it proved to be an effective tool in teaching reading. These groups include the learning disabled, people with limited proficiency in English, and the adult beginning reader. Little research is currently available to assess the utility of the decoder in teaching reading to these populations. To fill that gap, we conclude that various offices within the U.S. Department of Education should support research activities directed at each target population.

NCI conducted a study in 1986 that investigated the effects of four treatment conditions: 1) captioned-TV-with-sound; 2) captioned-TV-without-sound; 3) conventional TV; and 4) text-of-captions on the sight vocabulary, comprehension and oral reading of 77 learning disabled students. While the findings indicated that reading performance is enhanced by captions, it did not demonstrate statistically significant differences favoring captioned-television-with-sound compared to conventional television. Furthermore, only a small sample of learning disabled students participated in the study. The Office of Special Education and Rehabilitative Services should support further research in this area by institutions with expertise in the use of educational technology in instruction.

Participants in the focus groups suggested the possible use of decoders as an instructional tool for people with limited proficiency in English to help them learn English. One Korean participant commented that her brother-in-law bought a decoder to take home to Korea so that he and his friends could learn English more readily. An Hispanic participant also indicated that seeing the words on the screen would prove valuable in learning the language. To assess the validity of these views, the Office of Bilingual Education and Minority Language Affairs (OBEMLA) should support research that evaluates the effectiveness of the decoder as an instructional tool. If the research shows that decoders enhance reading among this population, the potential market for decoders could be expanded significantly.

A final group who may potentially benefit from the use of decoders are adult beginning readers. The use of a decoder as a learning tool might be appropriate for this population which relies on television as a major source of entertainment and information. We conclude that the Office of Adult and Vocational Education should conduct and support research to evaluate the effectiveness of decoders on enhancing the reading skills of this population.

- **EXPAND FOCUS GROUPS TO AREAS OF THE NATION MORE REPRESENTATIVE OF THE DEAF AND HARD-OF-HEARING POPULATIONS.**

The focus group methodology should be expanded to areas of the nation which are more representative of the deaf and hard-of-hearing population. As discussed in the "Methodology" section, Washington does not represent the norm for the deaf population. Additional data need to be collected nationwide to validate the findings developed from the preliminary round of focus groups. Metropolitan and rural sites should be included in the study to determine if there are differences based on living environments. In addition, it would be best to choose sites where community organizations can provide assistance in soliciting candidates for participation, as it is often difficult to solicit candidates for focus groups, particularly among the non-decoder owner groups.

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