

UC Berkeley

IURD Working Paper Series

Title

Estimating Need for Rehabilitation Services

Permalink

<https://escholarship.org/uc/item/0k67x6j0>

Author

Ridge, Susan Shea

Publication Date

1972-08-01

ESTIMATING NEED FOR REHABILITATION SERVICES

Susan Shea Ridge

August 1972

Working Paper No. 182/RS009

Frederick C. Collignon, Project Director - Michael B. Teitz, Principal Investigator

Project for Cost Benefit Analysis and Evaluation of Rehabilitation Services

The research reported here is being supported by a grant from the Rehabilitation Services Administration of the Social and Rehabilitation Service, U.S. Department of Health, Education and Welfare.

PREFACE

This paper serves two useful functions for those concerned with planning programs affecting disabled people. First, Ms. Ridge has reviewed extensively existing prevalence studies and has developed a simple and effective model for estimating the number of disabled persons in geographical areas or organizational jurisdictions for which basic demographic and socio-economic Census data are available. Her model is an important planning tool which should prove useful to state rehabilitation and social service agencies concerned with program planning and resource allocation. Previously, these agencies have had to estimate need for services by applying national prevalence rates to local raw population figures. Ms. Ridge's model permits a much finer estimate sensitive to the peculiar characteristics of an area. The second achievement of the paper is its provision of an estimate of the number of disabled individuals needing services nationally and in each of the states. Her estimates are conservative and yet clearly suggest the magnitude of the disabled population, a population which has been overlooked by the media, by politicians, by the concerned public, and even by many professionals concerned with social policy and services. Perhaps Ms. Ridge's estimates will prove helpful to those trying to attract greater public attention to our society's failure to meet the needs of our disabled population.

This paper has been adapted from a Master's Thesis which Ms. Ridge submitted to the Department of City and Regional Planning at

the University of California, Berkeley. The research represented by the paper was supported by a grant from the Rehabilitation Services Administration, D/HEW.

It is our hope and that of Ms. Ridge that the model presented in this paper will be supplanted in the next few years by new models based on 1970 Census data and several important prevalence studies currently in progress. We believe, however, that the pragmatic but technically sensitive approach taken by Ms. Ridge in adapting imperfect national prevalence data to the planning needs of state agencies is a useful model for policy analysts in the rehabilitation field to follow in the future.

Frederick C. Collignon

Michael B. Teitz

ACKNOWLEDGMENTS

I owe a great debt to the chairman of my thesis committee, Frederick C. Collignon, for his constant availability during the course of my work on this paper. His advice and comments were invaluable. I thank also the other members of my committee, Douglass B. Lee, Jr. and Michael B. Teitz, for their time and suggestions. Donald L. Foley, although not a member of my committee, gave freely of his time and provided extremely helpful advice and suggestions. Marta Fisch, the programmer who worked some long hours to help me meet a deadline, was indispensable. And I thank Norma Montgomery who suffered through a very last minute typing job.

I would also like to express my appreciation to the staffs of the National Health Survey, the Social Security Survey, and the State of California Department of Rehabilitation (especially Mary Brubaker) who gave me so much cooperation in discussing their respective work, and in providing very useful unpublished materials.

TABLE OF CONTENTS

PREFACE	ii
ACKNOWLEDGEMENTS	iv
LIST OF TABLES	vi
INTRODUCTION	1
CHAPTER I: THE PREVALENCE OF DISABILITY	2
CHAPTER II: WHO ARE THE DISABLED?: THE DEMOGRAPHIC CORRELATES OF DISABILITY	23
CHAPTER III: ESTIMATING THE DISABLED POPULATION IN GEOGRAPHIC AREAS	30
CONCLUSION	45
APPENDIX	47
SOURCES	49
POSTSCRIPT	52

LIST OF TABLES

I	ESTIMATES OF PREVALENCE OF DISABILITY IN THE CIVILIAN NON--INSTITUTIONAL POPULATION (%)	6
II	PREVALENCE OF DISABILITY BY MAJOR DISABLING CONDITION: ADULTS, AGED 18-64, 1970 POPULATION	14
III	ESTIMATES OF PREVALENCE OF DISABILITY IN THE CIVILIAN NON--INSTITUTIONAL ADULT POPULATION	18
IV	ESTIMATE OF DISABLED ALSO ELIGIBLE FOR VOCATIONAL REHABILITATION SERVICES	22
V	PREVALENCE RATES OF DISABILITY, ACCORDING TO SELECTED CHARACTERISTICS	24
VI	EDUCATION AND DISABILITY	27
VII	COMPARISON OF ESTIMATES OF NUMBERS OF DISABLED (000) AND PREVALENCE RATES OF DISABILITY (%) FOR ADULT POPULATION IN SELECTED STATES	38
VIII	SHARE OF DISABLED U.S. POPULATION IN SELECTED STATES ACCORDING TO ALTERNATIVE ESTIMATES	39
IX	NUMBER OF DISABLED, AGED 18-64, AND PREVALENCE OF DISABILITY FOR EACH STATE (1970 POPULATION)	43

INTRODUCTION

This paper presents a study of the prevalence of disability in the United States. There is no one source for information on prevalence of disability, and the two major surveys of disability provide widely disparate answers to the question of how many disabled persons there are. These two surveys are discussed in detail here, and conclusions are offered regarding their accuracy and reliability.

From this study of prevalence, some very important information arises. The fact is that disability systematically affects members of certain groups more than others. Chief among the groups who suffer high prevalence of disability are non-whites, low-income persons, older persons, and persons residing in rural areas.

This information on the demographic characteristics of the disabled is used to provide estimates of the number of disabled persons in each state, and thus to provide a measure of the need for rehabilitation services in each state. This same methodology would be applicable within a state, so that each district, or any small area for which demographic data is available, could be measured in terms of need for rehabilitation services.

Elsewhere,¹ I have used this methodology for estimating need in state and local areas, to evaluate the formulas by which federal funds are allocated to states, and by which states allocate funds to district and local offices. In that paper, significant imbalance is shown between need and current allocation patterns.

¹See Susan Shea Ridge, "The Allocation of Rehabilitation Funds: An Evaluation," Working Paper No. 183/RS010, Institute of Urban and Regional Development, University of California, Berkeley.

CHAPTER I

THE PREVALENCE OF DISABILITY

The Meaning of Disability

Disability is a fact of life for millions of people in this country. It directly affects those who, because of physical and mental impairments, are limited in their activities, and who may also suffer psychologically and economically. It will affect families of disabled persons, perhaps causing disruption of family relations or changes in the daily lives of individual family members. Disability is not without costs to the larger society -- through its effect on the economy because of the inability of many disabled to participate in productive activities; and in the costs of welfare payments, disability compensation, and other services provided for the disabled out of the tax dollar. Who are the disabled? How many are there? These are the questions which are addressed in the first two chapters.

Since the terminology used in discussions of disability can create some confusion, clarification of the various concepts seems advisable at the outset. The various terms can be understood to have a sort of "chain" relationship, as follows:

chronic condition → impairment → disability → handicap

"in need of" services → "could benefit from" services

A chronic condition refers to the presence of some health condition of long-standing, such as arthritis, hypertension, a heart condition. The

existence of a chronic condition may or may not be accompanied by an impairment, which is a "physiological or anatomical loss or other abnormality, or both."² An example of an impairment might be the absence of a limb, or a deformed spine. Of course, an impairment may be present long after the condition which caused it has remitted, or it may have arisen even without the existence of a chronic condition, such as loss of limb, caused by accident. Disability exists when an impairment causes a limitation on an individual's capacity to function, such as the inability to walk or write or lift. Note that the degree of disability may depend not only on the nature of the impairment but also on the characteristics of the person who suffers the impairment, and his reaction to the situation. A handicap arises when the disability imposes limitations on an individual's ability to carry on his or her usual activities, such as to perform on the job, or to play with other children, or to care for his or her own personal needs. If, as a counterexample, an individual were confined to a wheelchair by some disability but could continue to work at the same "desk" job as before and had found ways to compensate for the disability in other activities, a handicap would not be present. The final two terms in the chain, "in need of" and "could benefit from" services relate more specifically to eligibility and feasibility for service in the vocational rehabilitation system. These issues will be discussed later in this chapter.

It is apparent that the "chain" described can be broken at various points, and can also be entered at various points. Nor does the chain, as

²Saad D. Nagi, Disability and Rehabilitation: Legal, Clinical, and Self-Concepts and Measurement, p. 11.

described above, cover all situations. For instance, in the case of mental and psychological disorders, the distinction among the various points along the chain would not be as clear as with a physical condition.³ Similarly, in the case of cultural disadvantage, the handicap cannot readily be seen in terms of chronic condition, impairment and disability. But the literature on disability and its prevalence is replete with such terms, necessitating this clarification.

The Magnitude of Disability in the United States

How many people are disabled? Obtaining an accurate estimate is not a simple task. There is no single accepted source on the prevalence of disability in the United States. Until 1970, the Census asked no questions on disability. Data on handicap from the 1970 Census will not be available until at least late 1972. Even then, the new Census questions are very limited in scope, inquiring only about disability which affects a person's ability to work at a job.⁴ Limited scope is a characteristic of most studies which attempt to measure the prevalence of disability. Most studies are limited geographically, covering only one city, or county,

³Nagi, p. 13.

⁴The 1970 Census questions concerning disability were asked of a 5% sample of the population. They were:

28a. Does this person have a health or physical condition which limits the kinds or amount of work he can do at a job? (If 65 years old or over, skip to question 29.)

-Yes

-No

b. Does his health or physical condition keep him from holding any job at all?

--Yes

-No

c. (If "Yes" in a or b) How long has he been limited in his ability to work?

-Less than 6 months -3 to 4 years

-6 to 11 months -5 to 9 years

-1 to 2 years -10 years or more

or metropolitan area, or state. Another factor contributing to the difficulty of obtaining an estimate of disability prevalence is a definitional one. Various studies use differing definitions of disability. Different methods of obtaining information about disability are also used, such as household interviews versus institutional studies, or different questions are asked with varying potential for uncovering the true prevalence of disability.

This brief background on prevalence studies brings us to the estimates of disability prevalence provided by the major sources. These estimates are discussed in terms of their accuracy and what they tell us about the disabled population.

As can be seen from Table I, there is a broad range of estimates of the prevalence of disability, from 9.4% of the population to 17.2%. If applied to the current (1970) civilian, non-institutional population of the U.S., these rates would yield estimates of disability of from 18.8 million to 34.4 million persons.

There are a number of possible explanations for the broad variation among estimates. A careful study of the information presented in the footnotes of the table, and of the methodology discussions contained within the reports themselves, is the best way to evaluate the differences. The sources of variation can be of two types: the first, due to the fact that the eight studies presented deal with different geographical areas and different populations; the second, due to differences in the methodology used. We will treat the former in our discussion of the characteristics of the disabled, below. As to the latter, some of the most important differences in methodology are presented here so that some conclusion can be reached as to which estimate comes closest to the true prevalence of disability.

TABLE I

ESTIMATES OF PREVALENCE OF DISABILITY IN THE CIVILIAN NON-INSTITUTIONAL POPULATION (%)

Study Disability Status	National Health Survey 1965-69	NH Sub 1970	Social Security ^c	Cal. Health d	Cal. Hidden Minor- ity ^e	Kansas City of SUSA	Balti- more	Hunter- don	Kit Carson County ⁱ
Activity limitation	11.4	11.8	17.2	9.4	12.2	9.95	9.5	15.8	13.2
Unable to carry on major activity	2.1	8.9	5.9	1.9	7.6	2.14	-	2	2.5
Limited in amount or kind of major activity	6.4		11.3	7.5		5.03	-	13.8	
Limited, but not in major activity	2.9		-	-	4.5	2.78	-	-	10.7
Substantial Disability	-		-	-	-	-	1.1	-	-
Moderate Limitation	-		-	-	-	-	2.6	-	-
Slight Limitation	-		-	-	-	-	5.8	-	-

- ^a National Center for Health Statistics, Chronic Conditions and Limitations of Activity and Mobility, U.S., July 1965-1967, Series 10, #61. Household interviews over a 2-year period of a continuing representative sample of the civilian non-institutional population. See text for further description of this survey.
- ^b Unpublished data for the 1970 Health Interview Survey, made available by the National Center for Health Statistics. Same source and methodology as (a).
- ^c From the Social Security Survey of the Disabled, 1966, Report #2, "Disability Work and Income Maintenance Prevalence of Disability, 1966," May, 1968. A combination mail-screening and personal interview survey of a stratified sample of the population. Further details of this study in the text.
- ^d California Department of Public Health, Bureau of Chronic Diseases, Health and Medical Care Status of Californians: The California Health Survey, 1958, January, 1966. Methodology follows the National Health Survey.
- ^e California State Department of Rehabilitation, The Hidden Minority: Final Report of the California Rehabilitation Planning Project, July 1, 1969. Uses California Health Survey to project disabled population in later years.
- ^f Warren A. Peterson, Metropolitan Area Health Survey, Publication #127, Community Studies, Inc., Kansas City, Mo., June, 1959. Survey of a statistical sample of households. Concept of disability similar to that used in the National Health Survey.
- ^g Commission on Chronic Illness, Chronic Illness in the U.S., Vol. IV, Chronic Illness in a Large City: The Baltimore Study, Cambridge: Harvard University Press, 1957. A household survey of 1/8 of the non-institutional population of a large urban area. A clinical evaluation of a sub-sample was also performed.
- ^h _____, Vol. III, Chronic Illness in a Rural Area: The Hunterdon Study. Household survey of a sample population in a rural county in northern New Jersey.
- ⁱ U.S. Department of Health, Education and Welfare, A Health Study in Kit Carson County, Colorado, Public Health Service Publication #844, 1962. A household survey of a 50% sample of the population of an eastern Colorado county with a population of 7,000 in 2,200 square miles.

Comparison of the National Health Survey and the Social Security Survey

Most of the studies use the National Health Interview Survey's (NHS) tripartite definition of disability based on three types of activity limitation: (1) complete inability to carry on the major activity (work, keep house, go to school, play with other children -- depending on age and labor force status); (2) ability to carry on the major activity, but limited in amount or kind; (3) ability to carry on major activity without limitation, but limited in other ways.⁵ The Social Security survey uses slightly different terminology, but its categorizations are comparable, except that it does not present information on non-major activity limitations.⁶ The Baltimore study uses a range of degrees of disability, which we have condensed here, based largely on the type and amount of care needed by the disabled person. Mobility limitation was also measured in some studies, but it does not really constitute a separate measure of disability, for, as the NHS reports,

Most of the persons with mobility limitations also reported activity limitation. It is quite apparent that the degree of mobility limitation was associated with the degree of activity limitation these persons experienced.⁷

The duration disability required in order that an individual be defined as disabled varies: for instance, the Social Security survey reports only on those disabled longer than six months, while the National

⁵For further details, see National Center for Health Statistics, Chronic Conditions and Limitations of Activity and Mobility, U.S., July 1965-1967, Series 10, #61, p. 60. Further references to the National Health Survey will cite simply the Series and number of the National Center for Health Statistics publication.

⁶From the Social Security Survey of the Disabled: 1966, Report #2, "Disability, Work, and Income Maintenance: Prevalence of Disability, 1966," May, 1968, p. 2.

⁷National Center for Health Statistics, Series 10, #61, p. 2.

Health Survey obtains information about activity limitation status "at present," for anyone who either has one of certain specified conditions, or has been suffering from a chronic condition for more than three months.

The surveys were done at different times, the earliest in 1957, and the latest between 1965-1967. Since this is a relatively short time span in which to expect major changes, the results of the surveys can be considered comparable. Furthermore, the two most important studies, the National Health Survey and the Social Security Survey provide information for the same time period -- the former 1965-1967, and the latter 1966.

The most important differences are those pointed out by the authors of the Social Security Survey between their own and the National Health Survey. As Table I indicates, the Social Security Survey yielded a prevalence rate 1-1/2 times as large as NHS. In the NHS survey, only persons who reported a chronic condition were asked the disability questions. But the earlier discussion in this chapter illustrated that the "disability chain" can be entered later than the chronic condition point. Even when a chronic condition is present, many studies have shown that personal interviews yield a serious understatement of these conditions.⁸ Thus, the Social Security questionnaire, which focused directly on disability, identified more persons with limitations. There was also a difference in the treatment of women. The Social Security study included work limitation as well as housework limitation, regardless of current activity status. Thus, a woman who previously worked outside the home, but, because of onset of disability had switched to housekeeping would not be counted as limited by NHS, but would by Social Security. Another very important difference

⁸ See, for example, Charles F. Cannell, "The Reliability of Survey Data," in Neil, Shaw and Schull (eds.), Genetics and the Epidemiology of Chronic Diseases, 1963; Barkev S. Sanders, "Have Morbidity Surveys Been Oversold?" in Lilienfeld and Gifford (eds.), Chronic Diseases and Public Health, 1966.

between the two is that the Social Security survey included only persons between the ages of 18 and 64. As we will see, the excluded groups, age 0-17, and over 65, have very different prevalence rates from the group surveyed. The former have a very low prevalence and the latter a much higher prevalence rate. On balance, even the Social Security Survey, which gives the highest prevalence, may be a conservative estimate, if we are interested in the prevalence of disability in all age groups.

Since most of the estimates presented derive from household surveys, potential biases of this method, involving the knowledge and attitudes of the person being interviewed, must be considered. Usually one person is questioned regarding all household members. He or she will know the health status of other household members with varying degrees of certainty. Also, a layman's concept of disability may lead to underreporting (or overreporting): for instance, a problem of dimming vision may seem transitory and not be reported, or mental disorders may be considered "peculiarities" and not be reported. Social stigma or embarrassment may lead the respondent to omit mention of mental disorders or other disabilities which might seem embarrassing. Finally, some persons are reluctant to participate in any survey, and this will lead to a certain amount of non-response or hasty response, causing some underestimation.

Since the publication of the 1965-1967 NHS activity limitation data, the format of the NHS interview has been changed so that it now corresponds to the Social Security Survey in using a "person approach" rather than the earlier "condition approach." Thus, activity limitation questions are now asked of all persons, rather than only those who have indicated the presence of a chronic condition. Some unpublished information on the prevalence of activity limitation found using this new method in the 1970 survey has been made available and is included in Table I. This change

in method did not lead to much increase in the prevalence rates found by NHS, and so we must look elsewhere for explanation of the discrepancy between the Social Security data and the NHS data.

The difference in the treatment of women between the two surveys remains, and accounts for part of the discrepancy. Other differences between the National Health Survey and the Social Security Survey are outlined very clearly in the first report of the latter.⁹ Primary among these is that the Social Security Survey used first a mailed questionnaire to screen for the prevalence of disability, then followed up those identified as disabled with a personal interview. A rigorous testing of the reliability of the mail survey was conducted prior to its use, and the report of the results quite satisfactorily handles the questions raised by this method. The authors of the survey conclude that the use of the mail instrument provides a more accurate count, by eliminating interviewer bias, allowing each member of the household to answer for him or herself, and allowing more time for consideration. The Social Security Survey, while using the same basic concepts as the National Health Survey, used what was considered to be a less ambiguous question format. The Social Security Survey authors maintain that the risk of overidentification is much less than the risk of underidentification in their survey, since any respondent identifying himself as disabled was followed up by a personal interview with detailed questions. At this point, any respondent mistakenly self-identified as disabled would be eliminated. Along this line, the NHS estimates that only 39% of the males sampled in its survey are self-respondents (even less than this percentage for males between the

⁹From the Social Security Survey of the Disabled: 1966, Rept. #1, "Identifying the Disabled: Concepts and Measurement of Disability," December, 1967.

ages of 17 and 64). All Social Security Survey persons respond for themselves in the personal interview and thus more accurate reporting can be expected.

Another source of difference between the two surveys is the sample. The NHS sample is larger. Furthermore, the Social Security Survey sample is a stratified sample, with 3,700 of the 30,000 households known to have recipients of OASDI or ATD, and another 8,000 known to have members who had applied for and been refused OASDI benefits. However, both the National Health Survey and Social Security Survey sampling procedures are carried out in conjunction with the Bureau of the Census, and there is no evidence of any problem with the readjustment of the Social Security Survey results to the general population.

Thus, careful analysis of the differences between the two surveys, including consultation with NHS staff, leads us to conclude that the larger prevalence rate of the Social Security Survey is the more accurate.

The Institutionalized Population

It should also be noted that all of the estimates apply only to the civilian, non-institutionalized population. Naturally, the proportion of persons in institutions who are disabled can be expected to be much greater than among the general population. Statistics on the institutionalized population are not available in a form comparable with the prevalence rates for the non-institutionalized population. Some of the reasons for this are obvious: definition of disability in terms of employment status, or confinement to the home are not applicable to the institutionalized. Thus, criteria for determining disability among the

institutionalized are somewhat different.¹⁰

The Social Security Survey reports one half million severely disabled persons in long-term medical care institutions and schools and homes for the handicapped.¹¹ The National Health Survey's institutional survey showed 505,242 persons in institutions for the aged and chronically ill; 554,000 in nursing and personal care homes; and 558,000 patients in mental hospitals, excluding maximum security wards and children-only wards.¹² Not all of the 1.6 million are disabled according to NHS criteria. The disability rates range from about 20% to close to 60%, depending upon the type of disability and the age of the resident.

The conclusion to be drawn from this discussion is that the prevalence of disability is at least as great as that reported in the Social Security Survey: 17.2% of the civilian, non-institutional population, or about 34.4 million persons in 1970. Add to this 500,000 to 700,000 institutionalized disabled, and we find that some 35 million persons in this country are disabled. They are disabled by a variety of conditions, as Table II shows. Note that this table is for adults aged 18-64 only. The distribution would differ if younger and older age groups were included.

¹⁰The Social Security Survey reports only the number of severely disabled in the institutional population; the Public Health Service determines disability in terms of six health characteristics: bed status, walking status, continence status, mental status, hearing status, vision status. Each resident is classified as having no disability, partial disability, or complete disability, with respect to each characteristic. See National Center for Health Statistics, Series 12, #2, Appendix II, pp. 46-47.

¹¹The Social Security Survey of Institutionalized Adults: 1967, "The Severely Disabled in the Institutionalized and Non-Institutional Population, 1966," November, 1970. This estimate excludes correctional institutions, military hospitals, and nursing homes.

¹²National Center for Health Statistics, Series 12, #2; also Series 12, #8; and Series 12, #3.

TABLE II

PREVALENCE OF DISABILITY BY MAJOR DISABLING CONDITION:
ADULTS, AGED 18-64 1970 POPULATION*

Major Disabling Condition and ICD Code	Number of Persons (1000)	Prevalence Rates (%)
Total	19464.0	17.2
Musculo-skeletal disorders (720-749)	5997.6	5.3
Arthritis or rheumatism	2376.4	2.1
Back or spine impairments	2150.1	1.9
Loss or impairment of limbs	905.3	.8
Other musculo-skeletal conditions	452.6	.4
Cardio-vascular disorders (460-468)	4866.0	4.3
Heart trouble	2263.3	2.0
High blood pressure	1018.5	.9
Hemorrhoids	226.3	.2
Varicose veins	452.6	.4
Other cardio-vascular conditions	905.3	.8
Respiratory and related disorders (241, 245, 470-529)	2150.1	1.9
Asthma	792.1	.7
Other allergies	565.8	.5
Chronic bronchitis	226.3	.2
Emphysema	113.2	.1
Tuberculosis	226.3	.2
Other respiratory conditions	339.5	.3
Digestive disorders (540-586)	1358.0	1.2
Hernia or rupture	339.5	.3
Stomach ulcer	565.8	.5
Other digestive conditions	452.6	.4
Urogenital disorders (590-637)	452.6	.4
Endocrine-metabolic disorders (250-260)	792.1	.7
Diabetes	565.8	.5
Thyroid	226.3	.2
Mental disorders (300-329)	1244.8	1.1
Mental illness-nervous trouble	1018.5	.9
Mental retardation	226.3	.2
Nervous system disorders (330-369)	1018.5	.9
Epilepsy	226.3	.2
Multiple sclerosis	113.2	.1
Paralysis	226.3	.2
Stroke	226.3	.2
Other nervous system conditions	226.3	.2
Sense response disorders	679.0	.6
Visual impairments	452.6	.4
Deafness	226.3	.2
Neoplasms	339.5	.3
Other than specified conditions	565.8	.5

Source: From the Social Security Survey of the Disabled: 1966, Report #6, "Epidemiological Factors in Disability -- I: Major Disability Conditions," February, 1969, Table 7.

*Population figures in all tables are based on 1970 Census data.

The Effect of Disability: Multiple Disadvantage

The effect of disability is obvious from the nature of the word itself. We have seen the direct effect to be the type of activity and mobility limitations measured in the studies of prevalence: inability to hold a job, do housework or go to school, or limitations on what kind or how much work can be done. This directly affects the income of the disabled, and likely of the disabled's family. The Social Security Survey found that seven out of ten severely disabled men reported less income after becoming disabled. For the disabled as a whole, men and women, severely, occupationally, or only secondarily disabled, 37.3% reported their incomes reduced after onset of disability.¹³

There are other effects which cannot necessarily be measured in dollar terms. Financial dependence and/or dependence on others for physical needs or in social situations, whether partial or complete, are the results of disability for some. There are psychological and emotional adjustments to be made. Families of the disabled are affected, not only financially but also in terms of family life style. Another family member may be required to assume the role of "breadwinner," or may be required to devote large amounts of time to caring for the disabled person. The Hunterdon study reported that at least 5% of the families of disabled suffered such "restrictive or disorganizing" effects as lowered level of living, loss of educational opportunity for other members, relocation of the family, serious conflict leading to separation, divorce, or some member leaving home.¹⁴

¹³From the Social Security Survey of the Disabled: 1966, #16, p. 2.

¹⁴Commission on Chronic Illness, Chronic Illness in the U.S., Vol. III, Chronic Illness in a Rural Area: The Hunterdon Study, 1959, pp. 192-193.

The effects of disability can be compounded in certain situations. Naturally, the more severely disabled are more severely affected. The multiply disabled are likely to be more severely affected. Data on the number of multiply disabled persons is quite lacking. But we do know that disabled persons suffer, on the average, from 3.4 chronic conditions, and from 1.4 "limiting chronic conditions." As an example, the NHS showed that 22.9% of visually impaired persons also suffered hearing impairments.¹⁵ As the severity of activity limitation increases, so do the number of conditions present: persons completely unable to carry on the major activity suffered from 3.8 chronic conditions, and 1.8 "limiting chronic conditions."¹⁶

There is also a condition we might think of as "multiple disadvantage." When a minority person, or a woman, or a person with little education, who will already be marginal in the labor market, is also a disabled person, this person is clearly going to be multiply handicapped. Similarly, the older a person gets, the more difficult the adjustment to disability, in terms of finding a new "niche," will be. Although rehabilitation of the disabled has not been discussed here, it is clear that dealing with the physical condition alone will not eliminate the handicaps of these multiply disadvantaged disabled. This is not a minor problem since it is just these groups -- the poor, the old, the minority, the least educated -- who have the highest rates of disability.

Some 34 million persons in this country are disabled, representing over 17% of the population. The problem has multiple dimensions, and rehabilitation of the disabled is more complicated than simply dealing

¹⁵National Center for Health Statistics, Series 10, #46, Table K, p. 14.

¹⁶National Center for Health Statistics, Series 10, #61, Table B, p. 3.

with the disability itself. When persons with behavioral disorders (such as drug addicts, public offenders, and alcoholics) and the culturally disadvantaged are included among the disabled, the numbers swell even further. Likewise, the type of service needed changes.

Measuring Eligibility for Vocational Rehabilitation Services

Of course, not every disabled person will immediately be a candidate for vocational rehabilitation as eligibility is currently defined. The very young, the very old, and the disabled without vocational handicaps, or those whose disability is so severe that job-holding is not a viable goal, are not currently potential vocational rehabilitation clients. But even with a fairly narrowly defined concept of disability based only on job-related activity limitations, the Social Security Survey found more than 17 million disabled persons between the ages of 18 and 64, in 1966. Since this is the group of particular interest for the vocational rehabilitation program, we will examine more closely this potential vocational rehabilitation clientele.

Narrowing our consideration to age groups approximating the potential vocational rehabilitation clientele, we find the following prevalence estimates.

TABLE III

ESTIMATES OF PREVALENCE OF DISABILITY IN THE CIVILIAN
NON-INSTITUTIONAL ADULT POPULATION* (%)

Disability status	Study NHS 1965- 1967	NHS 1970	Social Security
Activity Limitation	11.7	12.1	17.2
Unable...major	1.4	8.7	5.9
Limited in major	6.8		11.3
Limited, not major	3.5	3.4	

Source: Same as Table I.

*NHS data are for age 17-64; Social Security data are for age 18-64.

These estimates represent between 13 million and 19.6 million persons. We have already discussed the reasons for this variation among the estimates. Our purpose now is to draw some conclusions as to how many among these disabled aged 18-64 are potential clients of the vocational rehabilitation process.

Basically, eligibility for vocational rehabilitation services requires the existence of a physical or mental condition which causes a loss of function or limitation of activities. The condition must be a handicap to employment, and the condition must not be so severe as to preclude the possibility of the disabled person holding a job. Thus, we must first restrict consideration to those limited in, or unable to perform the major activity, rather than those who have limitations, but not in the major activity. This will reduce the two NHS estimates by 3.5% and 3.4% respectively, but it will not affect the Social Security Survey estimates.

Recent legislation has broadened these criteria somewhat, so that, for example, persons with behavioral disorders (drug addiction, public offenders) are eligible for services, as well as the "culturally disadvantaged." Pending legislation may even broaden criteria to include the severely disabled who cannot have job-holding as a proximate goal. Not all of these extensions are operational, however, due to lack of funding or lack of uniform treatment among states.

Clearly, then, any disabled person who is in the labor force and unemployed is eligible, since such a person is actively seeking a job. The Social Security Survey provides information which allows us to estimate the size of this group. Disabled persons who are currently employed, and disabled persons not in the labor force, provide a more complicated question. Some of the currently employed may be underemployed, and would be eligible for services in an attempt to upgrade their employment. Also, some currently employed disabled persons may require services in order to maintain their employment (e.g., alcoholics, persons with deteriorating physical conditions). Disabled persons not in the labor force may wish to hold a job but not be actively seeking employment because of discouragement. Also, not in the labor force would be persons, especially women, who wish to become self-sufficient or more effective homemakers --- which does not require participation in the labor force.

There is some information on the disabled not in the labor force which can help to assess how many of these might wish to hold a job. Thus, an estimate of those who "could benefit from" vocational rehabilitation services can be obtained by adding: 1) the disabled unemployed, actively seeking work; 2) the disabled not in the labor force, who would be interested in work, 3) some allowance for the employed disabled, who might

benefit from a job up-grade; 4) the disabled not in the labor force who wish to improve their homemaking ability.

1) The disabled unemployed actively seeking work. The Social Security Survey¹⁷ shows 3.9% of the disabled fit into this category. Some adjustments must be made to this figure, however, if we are to apply it to 1970 population. This adjustment must allow for the change in the overall unemployment situation between 1966 and 1970. Under a simplifying, but obviously conservative, assumption that unemployment among the disabled rose proportionately to the rise in general unemployment (and thus that the disabled did not bear a greater burden of the economic recession vis-a-vis employment), the percentage of disabled unemployed would be 5.6% for 1970.

2) The disabled not in the labor force who would be interested in employment. This category involves two considerations. First, the disabled not in the labor force: the Social Security Survey, again, shows 47.4% of the disabled not in the labor force in 1966. Making a similar adjustment to 1970 as that made above, this figure would be 46.2%. But not all of the disabled not in the labor force will be interested in employment. Only those who would like to hold a job would be included in our estimate of those who could benefit from vocational rehabilitation services. A Bureau of Labor Statistics report found that 19.3% of persons under age 65 who were not in the labor force because of health or disability, wanted jobs.¹⁸ The combination of these two pieces of information will yield an estimate of the disabled not in the labor force who want jobs.

¹⁷From the Social Security Survey of the Disabled: 1966, Report #17, "Work and Earnings of the Disabled," November, 1971, Table 7, p. 30.

¹⁸Paul O. Flaim, "Persons not in the Labor Force: Who they are and why they don't work," Monthly Labor Review (92:7), July, 1969, pp. 3-14.

3) The employed disabled, who might benefit from services. The National Center for Health Statistics has estimated in an unpublished report that 10% of disabled employed persons fit into this category of being limited occupationally through underemployment.¹⁹

4) The disabled not in the labor force who wish to obtain or improve homemaking skills. This is the most difficult group to measure. A review of relevant literature yielded no viable methodology for dealing with this group. In the past, the Vocational Rehabilitation Administration simply applied a factor of 55% to the total number of disabled persons aged 17-59 to arrive at the eligible disabled.²⁰ There was no attempt to deal separately with the different labor force status groups. The Harbridge House analysis of state planning in vocational rehabilitation agencies improved upon the Vocational Rehabilitation Administration methodology by disaggregating into labor force status groups. However, its estimates of the "homemaking group" was also based on a simple 30% factor.²¹ Lack of adequate information on this group leaves no other alternative. Thus, the size of this group is estimated by taking 30% of the female disabled not in the labor force.

¹⁹Reported in Harbridge House, Inc., Estimates of Demand for Vocational Rehabilitation Services, 1968, 1975, prepared for Statewide Planning Project, Department of Vocational Rehabilitation, State of Illinois, p. III-11.

²⁰Monroe Berkowitz (ed.), Estimating Rehabilitation Needs, Rutgers: The Bureau of Economic Research, p. 10.

²¹Harbridge House, Inc., Analysis of Statewide Planning Reports for Rehabilitation, January, 1970, p. 31.

TABLE IV

ESTIMATE OF DISABLED ALSO ELIGIBLE FOR
VOCATIONAL REHABILITATION SERVICES

Total Disabled (000) ages 18-64		19,631	100.00%
1) Unemployed		1,099	5.6
2) Not in labor force	9,069		46.2
Desire to work		1,750	19.3
3) Employed	9,462		48.2
Underemployed		946	10.0
4) Not in labor force	6,898		
(female)			
Homemaking objective		2,069	30.0
Total eligible for services		5,864	

Thus, some 5.9 million persons are estimated to be disabled and eligible for services. It should be noted that this is a fairly conservative estimate of eligibility, since it does not include those eligible by virtue of behavioral disorders, or cultural disadvantage, and includes only those who can be rather strictly considered to be able to hold a job. Undoubtedly, some state agencies are more expansive in their assessment of an individual's eligibility.²²

In summary, then, we have considered various estimates of the prevalence of disability and have concluded that disability directly affects over 30 million persons in this country. In the age group 18-64, there are over 19 million disabled, defined in relation to ability to hold a job. Of these, almost 6 million are eligible for vocational rehabilitation services, by a conservative estimate.

²²Harbridge House reports on the various methodologies used in state agencies to measure the number of disabled persons who are eligible for services. There was considerable spread across states in these estimates and a wide variety of approaches was followed in developing the estimates. Harbridge House reported that rigorous methodologies were the exception, and that most state estimates of eligibility were "imprecise in definition" and "inadequate in delineation of relationships" among disability estimates, eligibility estimates and feasibility estimates.

CHAPTER II

WHO ARE THE DISABLED?:

THE DEMOGRAPHIC CORRELATES OF DISABILITY

The first chapter provided some evidence of the fact that disability prevalence varies among groups. There it was seen that the prevalence of disability for persons aged 18-64 is different from that for all age groups. The second chapter directly addresses the question of the prevalence of disability for different segments of the population. Who are the disabled? Disability affects young and old, rich and poor, black and white. But it does not affect these groups equally or randomly. All studies have shown that disability is more prevalent among poor, among non-whites, and among the aged. It also varies regionally, affecting rural areas more than urban.

Table V shows the age-adjusted²³ disability rates for different segments of the population as given in the two National Health Surveys, and the Social Security Survey. The absolute rates vary among the surveys for reasons already discussed, but the trends are similar.

The table shows that the prevalence of disability increases with age, and markedly so in the age group 65 and over. Even within the age group 18-64, as the Social Security Survey data shows, the prevalence of disability increases steadily within age subgroups.

²³Age-adjustment removes the effect on prevalence rates of differing age distributions among various population groups. For instance, women as a group are older than men; whites older than non-whites. Adjustment is to the age structure of the general population.

TABLE V

PREVALENCE RATES OF DISABILITY, ACCORDING TO
SELECTED CHARACTERISTICS

Selected Characteristics	Percent with Activity Limitation		
	Social Security ^a	National Health Survey 1965-1967 ^b	National Health Survey 1970 ^c
<u>Age</u>			
Under 17	--	1.9%	2.7%
17-44	(18-34) 7.8%	7.4	7.7
45-64	(35-44) 14.3	19.3	19.8
65 and over	(45-54) 23.2 (55-64) 36.2	46.0	42.1
<u>Sex</u>			
male	17.2	12.7*	12.8*
female	17.2	10.4	10.8
<u>Race</u>			
white	16.4	11.2	11.5
non-white	24.3	13.7	13.8
<u>Family Income</u>			
under \$3000		18.2	
\$3000-4999		12.6	17.9
\$5000-6999		10.4	
\$7000-9999	not available	9.7	11.0
\$10000-14999		8.9	
\$15000 and over		7.9	8.9
<u>Place of residence</u>			
"urban" (SMSA)	not available	7.3	not available
"rural" (outside SMSA)		10.8	

*The sex, race, family income and residence rates have been age-adjusted in the NHS data.

- Sources: a) Lawrence D. Haber, Demographic Correlates of Disability, unpublished paper, 3-25-68, Tables 1 and 2.
 b) National Center for Health Statistics, Series 10, #61.
 c) Unpublished data from the Health Interview Survey, National Center for Health Statistics.

The pattern according to sex is not so clear. The NHS shows greater disability among men than women. Actually, more detailed data show twice as many men as women completely unable to carry on the major activity, but more women limited in "other" activities. The Social Security Survey, on the other hand, shows more women "severely" disabled, but more men "occupationally" or "secondarily" limited.²⁴ Most other studies show higher prevalence rates for women, but many of them do not adjust for age, and women as a group are older than men. The age factor might, then, be responsible for the difference.

The likelihood of disability is greater for non-whites. A number of reasons have been suggested for this: for example, differences in disease resistance due to historical-cultural experience or genetics.²⁵ It is clear, though, that non-whites, due to racial and ethnic discrimination and prejudices, more often live in poorer environments and enjoy a lower standard of living than whites, as well as poorer access to good medical care. Such conditions may lead to poorer health and thus more disability; certainly, these conditions reduce the possibility of successfully overcoming the handicap presented by a disability.

The table shows a clearly inverse relationship between disability and income. There are two possible reasons for this: first, low income people are more susceptible to disability; or second, the onset of disability causes a reduction in income. As will be seen below, reduction in income is definitely an effect of disability and, thus, it is likely that both forces are at work here. Lower income persons will probably have poorer standards of living and access to medical care, as do minority persons, and

²⁴From the Social Security Survey of the Disabled: 1966, #2, p. 3.

²⁵Warren A. Peterson, Metropolitan Area Health Survey, Publication #127, Community Studies, Inc.: Kansas City, Mo., June, 1959, p. 121.

thus will be likely to contract more diseases, as well as be less equipped to deal with the effects of disease and disability.

The Social Security Survey shows that the median income (1965) of disabled persons was \$4176. For severely disabled persons, the figure was \$2406. Thirty-two percent of the disabled were in poverty and almost half (47.3%) of the severely disabled were in poverty.²⁶ These figures can be compared with the median income for the general population (in 1965) of \$6882²⁷ and a population in poverty of 17.1%.²⁸

Regionally, the highest prevalence rates are in the South, and the lowest in the Northeast. These two regions represent fairly well the most rural and the most urbanized parts of the country, respectively. Rural areas have large proportions of low-income persons, a group we have seen experiences more disability. The steady stream of outmigration over the past few decades from rural to urban areas is another factor. This outmigration has been characterized by a "self-selection" which leaves behind the less able-bodied and the more disadvantaged rural residents.²⁹

Disability is also correlated with education. The following table from the Social Security survey shows that more than 40% of disabled men had 8 years of schooling or less. Only 20% had completed high school.

²⁶From the Social Security Survey of the Disabled: 1966, Report #16, "Source and Size of Income of the Disabled," January, 1971, Table 32, p. 72.

²⁷U.S. Bureau of the Census, Statistical Abstract of the U.S.: 1967 (88th edition), Washington, D.C., 1967, Table 472, p. 333.

²⁸Ibid., Table 482, p. 338.

²⁹See, for example, John F. Kain and Joseph Persky, "The North's Stake in Southern Poverty," in the President's Advisory Commission on Rural Poverty, Rural Poverty in the United States, Washington, D.C., 1968.

TABLE VI
EDUCATION AND DISABILITY

	Men					
	Total	8 years or less	High school 1-3 years	4 years	College	Not Reported
U.S. population nondisabled....	100.0	19.9	19.9	34.6	25.9	-
Total disabled..	100.0	43.2	18.5	20.2	16.6	1.6
Severe.....	100.0	64.8	13.6	11.0	9.5	1.1
Occupational.....	100.0	40.3	21.1	20.7	15.7	2.3
Secondary.....	100.0	31.7	19.8	25.6	21.5	1.4

Source: From the Social Security Survey of the Disabled: 1966, Report #16, p. 27.

The direction of the relationship between disability and these characteristics -- poverty, age, race, education, residence -- is not a clear-cut one. Low income, as discussed above, might be a causal factor in disability because of the poorer health care of low-income persons. On the other hand, disability often leads to low-income status. Poor education, age, rural residence -- all of these characteristics have elements of both cause and effect of disability. A chain relationship may often be involved -- with minority status or age leading to low-income and poor education, which in turn may increase the likelihood of disability. When we observe, then, that poverty is associated with disability, it may be that poverty is more prevalent among the aged and minorities, and these characteristics are the factors more closely related to disability. It is obvious that there is much inter-correlation among all these characteristics -- age, poverty, race, education. The question of which comes first -- disability or poverty,

race or poor education -- can certainly not be resolved here. But one must be aware of the complex nature of the relationships among these demographic correlates of disability. Regardless of the direction of causality, the important fact remains that the prevalence of disability increases with age, poverty, minority status, or rural residence.

Thus, it is clear that while disability can affect anyone, the ranks of the disabled are heavily weighted with the aged, the poor, the minority, the rural, and the less educated.

As our study progresses, these patterns will be seen to hold within groups. For instance, the lowest income groups have the greatest prevalence of disability. But even if one looks only at the persons within an income group, say under \$5,000, it will be seen that disability prevalence increases with age.

This characteristic of disability -- that its prevalence varies across groups, by age, by race, by income, by type of residence -- is the central point in our analysis. For if disability is a greater problem among minorities, or the poor, or the old, or rural residents, this must be recognized in the distribution of resources to combat, or mitigate the effects of, disability.

At this point in time, the resources available for rehabilitation of the disabled are not distributed in such a way as to take full cognizance of this fact. Rather, a simple formula is used, at the federal level, based only on the population and per capita income of a recipient state. Similarly, at the state level, dollars for vocational rehabilitation are distributed without reference to prevalence differences across groups.

The information on the nature of disability prevalence has not previously been used to "test" the federal allocation formula. Our

purpose is to use the information on the demographic correlates of disability to perform this test. With the prevalence rates for specific demographic groups and with information on the demographic structure of the states, the number of disabled in each state can be estimated in a way that takes into account the essential fact that a state with larger proportions of these high disability groups will need more rehabilitation resources than a state of similar size with smaller proportions of aged, poor, or minority persons.

Chapter III will present these estimates, of the number of disabled in each state, and the methodology by which they were made.

CHAPTER III

ESTIMATING THE DISABLED POPULATION IN GEOGRAPHIC AREAS

Methodology

Table IV in Chapter II summarizes the available information on demographic correlates of disability. Examination of this data yields a potential methodology for estimating the number of disabled in any particular area (a state, an SMSA, a county, for instance) for which demographic information is available.

Given that the prevalence of disability varies with age, sex, race, income, and place of residence, a formula for estimating the disabled population in a given area would be:

$$D_k = \sum_{(asryp)-1}^m r(asryp) \cdot n_{(asryp)}_k$$

where D_k = the number of disabled in area k

$r(asryp)$ = the prevalence rate of disability disaggregated for each particular age-sex-race-income-place of residence group

$n_{(asryp)}_k$ = the number of people in area k belonging to each particular age-sex-race-income-place of residence group

To expand on the use of this formula, one might establish the following demographic groups:

age - 18-44; 45-54; 55-64
sex - male; female
race - white; nonwhite
income - under \$5,000; \$5,000-9,999; \$10,000+
place of residence - rural; urban

Combining these five characteristics would yield a number of smaller demographic groups such as: male whites, 18-44, with rural residences and family incomes under \$5,000; or female non-whites, 55-64, urban residents, with incomes of \$10,000 or more. The number of people in each group would be our " $n_{(asryp)}$'s."

One would then want a prevalence rate for each $n_{()}$, which would be the $r_{()}$. Application of the formula would give the number of disabled persons in any area of interest. The hypothesis is that this would give better information than if one were to estimate the number of disabled by simply saying that a constant percentage of any area's population is disabled.

While this is a methodology, and, in fact, a concept apparently unutilized in the rehabilitation system at either the federal or state level, the same basic idea has been presented and applied once previously,³⁰ by the National Center for Health Statistics (NCHS). The various reasons that this study has remained fairly unnoticed are not immediately apparent, and, at any rate, cannot be gone into here. The essence of the study will be presented, however, in order to clarify the differences between it and this effort, in methodology, and purpose.

The basic conceptual model used as an estimator by the NCHS is the same as what we have outlined above. The more detailed NCHS estimating equation involves adjustment of each state estimate based on the estimate of disability in that state's region. More demographic variables are used by NCHS, thus increasing the number of population

³⁰ National Center for Health Statistics, Synthetic State Estimates of Disability, Derived from the National Health Survey, Washington, D. C., 1968.

1970 census data which gives a more accurate count of the truly rural population than an SMSA-non-SMSA breakdown.

A final difference between the two studies is that this study is made in an immediate policy context. Its specific aim is to test the performance of federal and state allocation methods in distributing rehabilitation dollars according to need. The state (and California district) estimates are intended to be used to answer this question, and the methodology is intended to be one that is readily available to be used by states and at the federal level. Thus, it should be a methodology which is simple enough to be used at regular intervals (say, annually or semi-annually) to determine how funds should be distributed. And, it should be one for which the necessary data would be available to the state agency person without necessitating a time-consuming data search or access to very specialized, unpublished data.

It should be readily obvious (or it would become so as soon as a search were begun) that the type of data needed to apply the conceptual model to any state, or to any district within a state, is not at all readily available. In fact, such disaggregated data as the number of persons in a state in any of our "n-groups" is not available in any routinely available published source, not even the decennial census. While the NCHS study utilized unpublished data at their command to carry out the model, our task was to use available data to come as close to the conceptual model as possible and to utilize all the information available on demographic correlates of disability, even if not in the ideal form of the original model.

Thus, several separate estimates were made of the number of disabled in each state. There were five such estimates:

1. The age-sex-race estimate. The most disaggregated data available allowed for an estimate using the equation

$$D_k = \sum_{()=1}^{12} r_{(asr)} \cdot n_{(asr)_k}$$

where the r's are prevalence rates for each of 12 age-sex-race groups, and the n's are the number of persons in each age-sex-race group within each state.³² The data used is from the 1970 Census of Population.

One could also generate estimates using only one variable at a time, as

$$D_k = \sum_{()=1}^m r_s \cdot n_{s_k} \quad \text{or} \quad D_k = \sum_{()=1}^m r_a \cdot n_{a_k} \quad \text{or}$$

$$D_k = \sum_{()=1}^m r_r \cdot n_{r_k}$$

It will be recalled from Chapter II that the question of prevalence differences by sex was a moot one. The NHS data showed more disability among men, and also more "severe" disability among men. The Social Security survey showed no differences among men and women when all degrees of disability are considered, and more women severely disabled than men. Now, it was shown in Chapter I that the Social Security survey treatment of women should give a more accurate estimate of female

³²The exact estimating equation is:

$$D_k = .099(MW18-44_k) + .244(MW45-54_k) + .346(MW55-64_k) + \\ .119(MNWa8-44_k) + .312(MNW45-54_k) + .51(MNW55-64_k) + \\ .093(FW18-44_k) + .213(FW45-54_k) + .312(FW55-64_k) + \\ .175(FNW18-44_k) + .213(FNW45-54_k) + .56(FNW55-64_k)$$

Except where noted, all rates for this and the following equations are taken from an unpublished paper by Lawrence Haber, "Demographic Correlates of Disability," 3-25-68. This paper was based on the Social Security Survey. MW = white males; MNW = non-white males; FW = white females; FNW = non-white females.

disability than the NHS. Thus, there is no reason to do a separate estimate of disability based on sex differences alone, since the Social Security prevalence rate is 17.2% for both sexes. There are differences by sex within age and race groups --- for instance, male whites show more disability than female whites, but male non-whites have less disability than female non-whites. These differences will be accounted for in the first estimate -- the age-sex-race method. Thus, no separate estimate was made using sex rates alone. The next two estimating methods, then, were:

2. The age estimate.

$$D_k = \sum_{a=1}^4 r_a \cdot n_{a_k}^{33}$$

3. The race estimate.

$$D_k = \sum_{r=1}^2 r_r \cdot n_{r_k}^{34}$$

Because data on the income and place of residence variables is not available disaggregated by age, sex, and race, these variables could not be incorporated into a model of the form specified at the opening of this chapter. Thus, information on prevalence rates by family income and prevalence rates by place of residence were used to make separate

³³The equation is: $D_k = .078(18-34_k) + .143(35-44_k) + .232(45-54_k) + .362(55-64_k)$.

³⁴The equation is: $D_k = .164(W18-64_k) + .243(NW18-64_k)$. It should be noted that the non-white population is as defined by the Census, and Mexican-American, Puerto Rican and other Spanish-speaking persons are included in the white population.

estimates by income and by residence, giving the following two estimates:

4. The income estimate.

$$D_k = \sum_{y=1}^3 r_y \cdot n_{y_k}^{35}$$

Income data from the 1970 Census is not yet available. Income distribution data for each state, needed to obtain the "n_{y_k}'s" was taken from the "Survey of Buying Power" published annually in Sales Management.³⁶ Adjustments were needed to adapt this data, which is for the general population, to the 18-64 population, and from households to persons. The method by which this was done is shown in the Appendix.

5. The residence estimate.

$$D_k = \sum_{p=1}^2 r_p \cdot n_{p_k}^{37}$$

Data on rural versus urban residence is from the 1970 Census of Population.

Clearly, the generation of separate estimates of disability, using the various demographic correlates of disability one at a time, rather than in the original conceptual model, is a compromise to the

³⁵The equation is: $D_k = .381(18-64 \text{ under } \$5,000 \text{ income}_k) + .133(18-64 \text{ } \$5-9999_k) + .087(18-64 \text{ } \$10,000+_k)$.

The Social Security Survey does not provide prevalence rates by income, whereas the NHS does. Thus, the rates shown in the NHS 1970 Survey (for which unpublished data was made available to us) were used and adjusted to be consistent with the overall higher prevalence rate of disability given by the Social Security survey. This simply involved adjusting upward the NHS disaggregated rates which are based on an overall rate of 8.9% to the Social Security overall rate of 17.2%.

³⁶"Survey of Buying Power," Sales Management, Vol. 104, No. 13 (June 10, 1970), B-3.

³⁷The equation is: $D_k = .213(18-64 \text{ rural}_k) + .147(18-64 \text{ urban}_k)$.

Again, these rates are from the NHS data, for 1965-1967 (National Center for Health Statistics, Series 10, #45, Table 7) and adjusted to the Social Security rate.

available data. There will be five independent estimates, each utilizing some -- but not all -- of the information on the characteristics of the disabled. Our task is to determine how to combine the estimates, or choose among the estimates, so as to give the one best estimate of the number of disabled in each state, or whatever geographic area is being considered.

Such a reconciliation of the separate partially disaggregated estimates involves two related questions: whether the separate estimates are significantly different, and how much intercorrelation there is among the variables used in the estimation. If the five estimates do not give significantly different results from a flat 17.2% estimate, then the partial disaggregation along demographic characteristics would not be an improvement over the constant population percentage estimate.

If there is no intercorrelation among the variables -- age, sex, race, income, residence -- then each of the five estimates would be independent, and could be summed to give the first estimate. The discussion in Chapter II, however, made it clear that the "no-correlation" situation is not the case. There is a relationship among the variables, and thus the five estimates are not statistically independent. The extent of the intercorrelation is not easily observed, but correlation analysis gives a measure of this relationship and allows some decisions about the estimates to be made.

How disparate are the results given by the different estimating methods? The following table shows, for selected states, the number of disabled in each state, as predicted by the five different methods, and the prevalence rates of disability that these estimates represent. The final column shows the corresponding figures for an estimate based on a flat 17.2% of the adult population.

TABLE VII

COMPARISON OF ESTIMATES OF NUMBERS OF
DISABLED (000) AND PREVALENCE RATES OF DISABILITY (%)
FOR ADULT POPULATION IN SELECTED STATES

State \ Method	1	2	3	4	5	17.2%
California	1893.8 (16.4%)	1894.8 (16.4%)	1985.6 (17.2%)	1848.3 (16.0%)	1759.5 (15.3%)	1980.8 (17.2%)
Mississippi	215.0 (18.6)	195.7 (17.0)	216.9 (18.8)	255.2 (22.1)	209.6 (18.2)	198.0 (17.2)
New York	1809.4 (17.3)	1807.0 (17.3)	1813.0 (17.4)	1618.2 (15.5)	1621.3 (15.6)	1789.5 (17.2)
Rhode Island	90.4 (16.6)	93.3 (17.2)	90.4 (16.6)	87.0 (16.0)	84.6 (15.6)	93.3 (17.2)
South Dakota	58.0 (16.9)	59.8 (17.4)	57.4 (16.7)	63.1 (18.3)	62.4 (18.2)	59.0 (17.2)
Wisconsin	390.1 (16.5)	402.9 (17.0)	393.4 (16.6)	382.7 (16.2)	396.9 (16.8)	406.1 (17.2)

A correlation matrix, comparing the prevalence rates generated by the six different methods, for all states, showed low correlation among the estimates. The highest coefficient was .590, between the income and residence estimates. A high correlation between these two would suggest that family income is related to rural vs. urban residence. For our purposes, it begins to suggest that there may not be a need for separate estimates based on income and residence. The age-sex-race estimate was shown to be correlated with the separate age and race estimates ($r = .542, .583$), as would be expected. It would be anticipated that there would be no need for three separate estimates here, and that the age-sex-race estimate would contain all the information needed. There was virtually no correlation between the age-sex-race and income or residence estimates ($r = .214, -.087$).

The essential point of interest is in how these varying estimates of the number of disabled persons in each state translate into changes in

the share of federal funds that would be allotted to each state. Thus, it would be instructive to compare the different estimates on the basis of the shares of the total U.S. disabled in each state. For instance, 2.8% of the total U.S. disabled are estimated to reside in Massachusetts on the basis of the adult population in that state, but when the income estimate is used, Massachusetts contains only 2.4% of the total number of disabled persons.

The following table shows, for selected states, these proportions of total U.S. disabled in each state, as estimated by the five methods. For purposes of comparison, the final column shows the share of disabled

TABLE VIII
SHARE OF DISABLED U.S. POPULATION IN SELECTED
STATES ACCORDING TO ALTERNATIVE ESTIMATES

Method \ State	1	2	3	4	5	$\frac{P_s}{P_{ns}}$
California	10.0%	9.8%	10.1%	9.7%	9.5%	9.8%
Mississippi	1.1	1.0	1.1	1.3	1.1	1.1
New York	9.5	9.4	9.2	8.5	8.7	8.9
Rhode Island	.5	.5	.5	.4	.5	.5
South Dakota	.3	.3	.3	.3	.3	.4
Wisconsin	2.0	2.1	2.0	2.0	2.1	2.2

in each state based on the hypothesis that the general population of a state is a good measure of the number of disabled in that state -- i.e., the share of total population equals the share of disabled population. This is the assumption used in the federal allocation formula, and by many states, as we will see.

As with the prevalence rates in Table VII, one wants some indication of whether these new share estimates will involve substantial adjustments to the straight population estimate. It is also important to know whether the five new estimates would all affect the population estimate in the same way, or if each necessitates a different type of adjustment to the estimate based on the general population alone (the intercorrelation problem).

Correlation analysis again is used to answer these questions. Since the concern is what adjustments will be made to a population share estimate, we look at each estimate in terms of the difference between the estimated shares for the states and the population shares for the state. For example, from Table VII, one sees that California's "population" share is 9.8% of total U.S. disabled, and its "residence" share (estimate 5) is 9.5%: the difference, then, is .3%. We want to compare the five estimates on the basis of these differences. Now, these differences represent the adjustment to each state's share necessitated by the new estimating methods. Each method will cause some states to gain in share and others to decline. Thus, for any one method, the mean adjustment will be 0, because the sum of the gains and declines will cancel each other out. But the standard deviations of the adjustment will indicate what the relative magnitude of the adjustment will be for each method:

<u>method</u>	<u>standard deviation</u>
age	.1229
race	.1038
income	.2314
residence	.1287
age-sex-race	.1309

The income estimate necessitates the most substantial adjustment to the population share -- about twice the adjustment made by the other

four estimates. All five estimates do necessitate some adjustment to the population shares. The smallest -- the race estimate -- involves a .1% change in the average state's population share. This average share is 1.96%, so even this small adjustment is over a 5% increase or decrease in share for the average state.

The correlation matrix for these five methods (in terms of the differences)

	age	race	income	residence	age-sex-race
age	1.000	.415	-.076	.026	.758
race		1.000	.171	.121	.738
income			1.000	.567	.014
residence				1.000	.060
age-sex-race					1.000

shows that the age-sex-race, age, and race estimates are highly correlated, and the income and residence rates are highly correlated. But there is no correlation across these two groups. This is the same conclusion we reached in comparing the prevalence estimates of Table VII. Looking again at the standard deviations, one can see that, in the first group, the age-sex-race estimate makes the greatest adjustment to the population shares, and thus the separate age and race estimates can be eliminated, since correlation analysis shows that any adjustments made by these are similar to those made by the age-sex-race estimate. On similar grounds, the residence estimate can be eliminated in favor of the income estimate.

Thus, from the five original estimates, two remain -- income and age-sex-race -- each of which improves on the population share by taking into account the demographic correlates of disability.

Since they are, however, two separate estimates, we must combine them in some way, so as to obtain one best estimate of each state's disabled population, and share of the total disabled population in the United States.

No a priori justification exists for a relative weighting of the two estimates, thereby giving one of the estimates more importance than the other. Thus, an unweighted average of the two estimates was chosen as the form for a composite age-sex-race-income estimate.

State Estimates

Based on this methodology, the following table shows the number of disabled persons, aged 18-64, in each state.

These figures on the number of disabled persons in each state and the District of Columbia are based on the demographic correlates of disability. Our study of the prevalence of disability led to the conceptual model for estimating the disabled population in any area. This model was adapted to the data available, so that an estimating method could be devised which would be useful to decision-makers and policy-makers at various levels in the rehabilitation system. This compromise to readily available data was preferred because the type of data necessary to apply the original conceptual model would require time-consuming data search and manipulation. This type of effort would seriously reduce the usefulness of a methodology as a policy tool. Our research has shown that even with extensive search, the highly disaggregated data needed to apply the conceptual model is not available to most persons or agencies. Thus, we have devised a method for estimating the number of disabled in any state, which is a readily available policy tool. The equations for both the income and age-sex-race estimates have been

TABLE IX

NUMBER OF DISABLED, AGED 18-64, AND PREVALENCE OF
DISABILITY FOR EACH STATE (1970 POPULATION)

State	Number of Disabled (000)	Prevalence of Disability (%)
Maine	90.35	16.93
New Hampshire	65.85	16.27
Vermont	39.60	16.49
Massachusetts	497.75	15.67
Rhode Island	88.70	16.35
Connecticut	266.65	15.49
New York	1713.80	16.47
New Jersey	652.80	15.98
Pennsylvania	1122.40	16.82
Ohio	952.25	16.32
Indiana	465.60	16.28
Illinois	1002.15	16.10
Michigan	771.55	15.84
Wisconsin	386.40	16.37
Minnesota	328.30	16.30
Iowa	253.95	16.94
Missouri	452.75	17.67
North Dakota	56.40	17.35
South Dakota	60.55	17.65
Nebraska	135.15	17.05
Kansas	210.80	17.09
Delaware	51.30	16.71
Maryland	357.65	16.25
Washington, D.C.	82.90	17.96
Virginia	460.95	17.12
West Virginia	178.15	18.39
North Carolina	517.20	17.79
South Carolina	265.80	18.40
Georgia	458.45	17.79
Florida	683.05	18.50
Kentucky	318.10	18.00
Tennessee	407.80	18.43
Alabama	363.00	19.27
Mississippi	235.10	20.42
Arkansas	203.75	19.78
Louisiana	360.70	18.53
Oklahoma	260.35	18.31
Texas	1078.95	17.39
Montana	65.30	17.52
Idaho	67.05	17.58
Wyoming	27.30	18.93
Colorado	203.40	16.33
New Mexico	93.20	17.27

TABLE IX (Cont.)

State	Number of Disabled (000)	Prevalence of Disability (%)
Arizona	162.75	16.86
Utah	89.00	15.96
Nevada	46.50	16.36
Washington	312.95	16.24
Oregon	199.45	17.09
California	1871.05	16.25
Alaska	24.90	14.37
Hawaii	76.20	16.93

presented. These can be applied to any area for which basic demographic information is available.

The final estimates, shown in Table IX, reflect the different demographic structures in each state. Such differences must be taken into account if accurate figures on the number of disabled persons are to be obtained.

CONCLUSION

The disabled are a very substantial minority in this country, representing 17.2% of the adult population. Chapter I examined the problems involved in arriving at such an estimate. By careful analysis of the various surveys of the United States disabled, we have been able to arrive at this figure. Previous to this study, no real attempt has been made to reconcile the differences between the two major disability surveys, and arrive at an overall estimate of the magnitude of the disabled population in the United States.

Of the over 19 million disabled adults, our estimate is that 6 million are currently eligible for services from the federal-state vocational rehabilitation system, by a conservative definition of eligibility.

In Chapter II, the important fact that disability is more prevalent among certain segments of the population was presented.

A method for estimating the number of disabled persons in any area, based on demographic information about the area, and prevalence rates of disability for various demographic groups was presented. The prevalence rates and formula for the estimate were presented, and the demographic information needed to apply the formula is readily available from such sources as the decennial Census, Current Population Reports, and Survey of Buying Power.

The estimate for any area can be made by using the age-sex-race and income formulas presented in Chapter III. The age-sex-race estimate

is

$$D_k = \sum_{asr=1}^{12} r_{asr} \cdot n_{asr_k}$$

The actual formula simply requires plugging in data on each of the twelve age-sex-race groups to the following equation:

$$\begin{aligned} D_k = & .099(MW18-44_k) + .244(MW45-54) + .346(MW55-64) + \\ & .119(MNW18-44) + .312(MNW45-54) + .51(MNW55-64) + \\ & .093(FW18-44) + .213(FW45-54) + .312(FW55-64) + \\ & .175(FNW18-44) + .213(FNW45-54) + .56(FNW55-64) \end{aligned}$$

The income estimate is

$$D_k = \sum_{y=1}^3 r_y \cdot n_{y_k}$$

The actual formula for this estimate is

$$\begin{aligned} D_k = & .381(18-64 \text{ under } \$5,000) + .133(18-64 \text{ } \$5,000-9,999) + \\ & .087(18-64 \text{ } \$10,000 \text{ plus}). \end{aligned}$$

The age-sex-race-income composite estimate is simply

$$D_{asry} = \frac{D_{asr} + D_y}{2}$$

APPENDIX

Income Distribution Adjustment

The "Survey of Buying Power" (SBP) gives the percentage distribution of households in each of seven income groups (under \$3,000, \$3,000-4999...) by states. Our needs required income information on persons 18-64. The following methodology for adjusting the SBP data was suggested by Douglass B. Lee, Jr., Assistant Professor of City and Regional Planning, University of California at Berkeley.

The basic methodology was to: (1) convert from an income distribution for all households to households with heads under age 65; (2) convert from households with heads under 65 (actually 14-64) to persons 18-64.

(1) Using information on U.S. distribution of household income by age of household head,³⁸ one can construct a ratio (R65-) of the percent of households in any given income group with heads under 65. Thus, approximately 54% of households with incomes under \$5,000 are headed by persons 65 and under; 87% of households with incomes from \$5,000-9999 are headed by persons 65 and under; and 94% of households with incomes of \$10,000 and over are headed by persons 65 and under. These ratios can then be applied to each state's household income distribution, as reported in SBP.

³⁸U.S. Bureau of the Census, Current Population Reports, Consumer Income, Series P-60, No. 72, August 14, 1970, Table 2, p. 12.

(2) For each state, a ratio can be constructed of the number of persons 18-64 to the number of households headed by persons 18-64. This factor can then be applied to the new income distribution obtained in (1) to convert from households to persons.³⁹

This methodology can be expressed as follows:

$$R65^- = \frac{hh_i^{us}}{HH_i^{us}} \quad \text{where} \quad R65_{i,us}^- = \text{the ratio described in (1) above}$$

$$hh_i^s = R65_{i,us}^- (HH_i^s)$$

$$hh^s = \sum_{i=1}^3 hh_i^s$$

$$p_{i^s,65^-} = \left(\frac{p^{s,65^-}}{hh^s} \right) \left(hh_i^s \right)$$

hh = the number of households with heads age 14-64

HH = the number of households with all age heads

i = the given income group

s = the state

p65^- = the number of persons aged 18-64

³⁹The simplifying assumption here is that household size does not vary with income.

SOURCES

Disability Surveys

California Department of Public Health, Bureau of Chronic Diseases.
Health and Medical Care Status of Californians: The California Health Survey, 1958, January, 1966.

California State Department of Rehabilitation. The Hidden Minority: Final Report of the California Rehabilitation Planning Project.

Commission on Chronic Illness. Chronic Illness in the U.S. Volume IV, Chronic Illness in a Large City: The Baltimore Study. Cambridge: Harvard University Press, 1957.

. Volume III, Chronic Illness in a Rural Area: The Hunterdon Study. Cambridge: Harvard University Press, 1957.

National Center for Health Statistics. Vital and Health Statistics. Data From the National Health Survey.

Characteristics of Visually Impaired Persons, U.S., July, 1963-June 1964, Series 10, #46.

Chronic Conditions and Limitations of Activity and Mobility, U.S., July 1965-1967, Series 10, #61.

Characteristics of Residents in Institutions for the Aged and Chronically Ill, Series 12, #2.

Characteristics of Patients in Mental Hospitals, U.S., April - June 1963, Series 12, #3.

Prevalence of Chronic Conditions and Impairments Among Residents of Nursing and Personal Care Homes, U.S., May - June, 1964, Series 12, #8.

Unpublished data from the 1970 Health Interview Survey supplied by mail.

Peterson, Warren A. Metropolitan Area Health Survey. Publication #127. Kansas City: Community Studios, Inc., June, 1959.

U.S. Department of Health, Education and Welfare. A Health Study in Kit Carson County, Colorado. Public Health Service Publication #844. 1962.

U.S. Department of Health, Education and Welfare, Social Security Administration, Office of Research and Statistics. From the Social Security Survey of the Disabled: 1966.

- Report #1. Lawrence D. Haber. Identifying the Disabled: Concepts and Methods in the Measurement of Disability. December, 1967.
- Report #2. _____. Disability, Work and Income Maintenance: Prevalence of Disability, 1966. May, 1968.
- Report #3. _____. The Effect of Age and Disability on Access to Public Income Maintenance Programs, July, 1968.
- Report #6 _____. Epidemiological Factors in Disability: I. Major Disability Conditions. February, 1969.
- Report #10. _____. II. The Measurement of Functional Capacity Limitations. July, 1970.
- Report #12. Ralph Treitel. Rehabilitation of the Disabled. September, 1970.
- Report #13. Idella G. Swisher. Family Income of the Disabled. October, 1970.
- Report #14. Lawrence D. Haber and Philip Frohlich. The Severely Disabled in the Institutional and Non-Institutional Population, 1966. November, 1970.
- Report #16. Idella G. Swisher. Sources and Size of Income of the Disabled. June, 1971.
- Report #17. Gertrude L. Stanley. Work and Earnings of the Disabled. November, 1971.

Demographic Data

- "Survey of Buying Power." Sales Management. Vol. 104, No. 13 (June 10, 1970).
- U.S. Department of Commerce, Bureau of the Census. Census of Population, 1970. General Population Characteristics. Advance Reports. Series PC(V2).
- _____. Final Report. Series PC(1)-B.
- _____. Current Population Reports. Consumer Income. Series P-60, #72. August 14, 1970.
- _____. Statistical Abstract of the U.S.: 1967. (88th edition.) Washington, D.C., 1967.

Other

Berkowitz, Monroe (ed.), Estimating Rehabilitation Needs, (New Brunswick: Bureau of Economic Research, Rutgers, 1967).

Cannell, Charles F. "The Reliability of Survey Data," in Neil, Shaw, and Schull (eds.), Genetics and the Epidemiology of Chronic Diseases, 1963.

Conley, Ronald W. The Economics of Vocational Rehabilitation. (Baltimore: The Johns Hopkins Press), 1965.

Flaim, Paul O. "Persons Not in the Labor Force: Who They Are and Why They Don't Work," Monthly Labor Review (92:7), July, 1969, 3-14.

Harbridge House, Inc. Analysis of Statewide Planning Reports for Rehabilitation: Comprehensive Report. Prepared for Rehabilitation Services Administration, Social and Rehabilitation Service, Department of Health, Education and Welfare. January, 1970.

Estimates of Demand for Vocational Rehabilitation Services 1968, 1975. Prepared for Statewide Planning Project, Division of Vocational Rehabilitation, State of Illinois. Undated.

Kain, John F., and Joseph Persky. "The North's Stake in Southern Poverty," in The President's Advisory Commission on Rural Poverty, Rural Poverty. Washington, D.C., 1968.

Nagi, Saad D. Disability and Rehabilitation: Legal, Clinical and Self-Concepts and Measurement. (Ohio State University Press), 1969.

National Center for Health Statistics. Synthetic State Estimates of Disability, Derived from the National Health Survey, Washington, D.C., 1968.

Ridge, Susan Shea. "The Allocation of Rehabilitation Funds Among States and Districts: An Evaluation," Working Paper No. 183, Institute of Urban and Regional Development, University of California, Berkeley, 1972.

Sanders, Barkev S. "Have Morbidity Surveys Been Oversold?" in Lilienfeld and Gifford (eds.), Chronic Diseases and Public Health. (Baltimore: The Johns Hopkins Press), 1966.

Unpublished Information

Haber, Lawrence D. Demographic Correlates of Disability. Unpublished paper, 3-25-68.

POSTSCRIPT

Accurate information on the prevalence of disability is important for the entire vocational rehabilitation system. It is of interest at the federal level for determining the magnitude of need for rehabilitation services. Knowledge of the numbers of disabled persons in each state, or districts within states, can improve program planning at these levels. This has been the purpose of the estimating method presented here.

More studies of the prevalence of disability are being done. In addition to the ongoing National Health Survey, which is continually being revised and improved, other surveys have been and will be taken. The Survey of Economic Opportunity included questions on disability, and data from this source will soon be available. A survey is being conducted out of Ohio State University with R.S.A. funding which attempts to refine some of the currently used disability survey methods. Finally, the Census has begun to incorporate questions on disability. When the 1970 Census figures become available later this year, figures on disability will be available for the first time at state, metropolitan area, county, city, and even Census Tract levels. These figures will have to be scrutinized in terms of comparability to previous surveys, and problems in the methodology used. Such techniques as the estimating method presented here may remain necessary to obtain accurate figures for prevalence at these levels. But as Census questions are refined in future years, we may expect to be able to determine the magnitude of disability with greater ease than at present.