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ABSTRACT

This report provides results from an investigation of comparative disability risks of specific chronic physical and mental illnesses, diseases, and impairments. National estimates are presented of the risks of chronic health conditions causing disability--including activity limitation, work disability, and need for assistance in basic life activities--based on an analysis of data from the National Health Interview Survey (NHIS), a continuing survey of the health of the noninstitutional United States population. Risks of disability are estimated and compared for 62 specific chronic health conditions or groups of health conditions adjusted for age, gender, and other social and demographic factors. Major highlights of the report include: (1) most chronic conditions do not have high risks of disability (about 11.7 percent cause activity limitation); (2) the risk of disability is inversely related to prevalence of chronic conditions; (3) the epidemiology of disability is quite different for children than for adults; (4) risks of disability increase with age for most conditions (e.g., risk of chronic conditions causing work limitation is 4.3 times higher at ages 45-69 than at ages 18-44); and (5) mental illness conditions have low to moderate risks of causing disability, compared to physical health conditions. Extensive tables detail the report's findings. (Contains 39 references.) (DB)

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REPORT 2

Disability Statistics Report

Disability Risks of Chronic Illnesses and Impairments

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Disability Risks of Chronic Illnesses and Impairments

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Introduction

Disability is a limitation, caused by one or more chronic physical or mental health conditions, in performing activities that people of a particular age are generally expected to be able to perform (Haber, 1967; Nagi, 1976). Such activities consist of roles and role-related activities,[1] the major types being play for infants, attending school for children, working at a job or keeping a home for working-age adults, and carrying out basic life activities necessary to live independently for all mature persons.

Disability risk refers to the likelihood that a chronic illness or impairment causes disability. Chronic conditions are by definition antecedents of disability, but they vary considerably in disability risk. Knowledge of the comparative disability risks of chronic conditions is important in understanding the origins of disability, yet little systematic research exists on this subject, especially at the national level.

In order to compare fairly disability risks of various chronic conditions, several factors that influence disability risk must be taken into account. From the clinical perspective, chronic health conditions differ in degree of functional limitation, prognosis, course of treatment and management, and rehabilitative potential, all of which are related to disability. In addition, disability is influenced greatly by the demands, expectations, and resources of the social and physical environments.

Populations defined by the presence of specific health conditions often differ in demographic and environmental characteristics. For example, widespread evidence exists that numerous chronic physical health conditions are distributed more frequently among persons of lower than higher social class (for a review, see Dutton, 1986). Some chronic conditions are more highly associated than other conditions with lower social class. Since persons of lower social class are also more likely to have a disability, social class must be taken into account in order to compare disability risks of various conditions. Social class is an illustration; a variety of biologic, individual, and environmental factors must be assessed to develop an understanding of disability risks of chronic health conditions.

We can separate factors influencing the risk of disability into two classes: those intrinsic to health conditions and those related to the characteristics of the individual and the social and physical environments. To compare fairly disability risks of specific chronic conditions, it is desirable to identify risks that are intrinsic to each condition, what may be viewed as part of the "natural history" of a condition. However, the identification of risks truly intrinsic to health conditions remains an elusive goal. Risks of disability estimated for various chronic conditions will subsume, in addition to the intrinsic risks of the conditions, all the effects of nonintrinsic factors that remain uncontrolled. Measures of sociodemographic characteristics can be controlled statistically to provide an adjustment to better approximate intrinsic disability risks of chronic conditions.

Comparative data on disability risks of specific chronic illnesses and impairments have manifold uses:

1) Disability is an important measure of the consequences of chronic health conditions in the lives of individuals. Comparison of risks of disability of various conditions provides one index of their social importance.

2) Information on disability risks for various conditions has direct use in health and social policy. Knowledge of disability risks of chronic health conditions can be useful in designing services for prevention, treatment, management, rehabilitation, and social assistance. Conditions that usually result in particularly severe disability often require intensive acute and long-term medical and social services and generate high demand for social assistance.

3) Combined with knowledge of the prevalence of conditions and methods to prevent disability from them, information on disability risks can be useful in prioritizing interventions to reduce disability.

4) Information on disability risks of specific health conditions can also be useful in designing data systems to estimate the prevalence and social burden of chronic conditions in populations. It is often neither possible nor desirable to enumerate the prevalence of all chronic health conditions in the population. However, conditions with high disability risks, or otherwise high social burden, should be identified for the reasons stated above.

This report provides results from an investigation of the comparative disability risks of specific chronic physical and

[1] This definition differs from the ICIDH schema (World Health Organization, 1980), as noted by Granger (1984).

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mental illnesses, diseases, and impairments. National estimates are presented of the risks of chronic health conditions causing disability -- including activity limitation, work disability, and need for assistance in basic life activities -- based on analysis of data from the National Health Interview Survey (NHIS), a continuing survey of the health of the noninstitutional United States population. Risks of disability are estimated and compared for 62 specific chronic health conditions or groups of health conditions. Multivariate logistic regression is used to adjust for age, gender, and other social and demographic factors that vary by condition and affect disability risks. Such adjustment affords an approximation to intrinsic disability risks of chronic conditions. Since the NHIS does not yield baseline prevalence estimates of mental health conditions, data from other sources on mental health conditions and disability risks are discussed and compared to physical health conditions.

Highlights

- Most chronic conditions do not have high risks of disability. About 11.7 percent of conditions identified in the NHIS cause activity limitation, the broadest measure of disability.
- The risk of disability is inversely related to the prevalence of chronic conditions. Conditions high in prevalence typically have low risks of disability, while conditions low in prevalence typically have high risks of disability.
- Impairments have the highest risks of disability. But several chronic diseases have relatively high risks of disability, exceeding risks of many impairments.
- Overall, females report 40 percent more chronic conditions than males. Yet, gender differences in risks of activity limitation of chronic conditions are small, especially with respect to differences between conditions. However, chronic conditions are less likely to cause need for assistance in basic life activities among males.
- Most of the high risk conditions occurring among children are different from those with high risks at all ages. These results confirm that the epidemiology of disability is quite different for children than for adults.
- Impairments have relatively higher risks of causing limitations in the amount or kind of work, whereas diseases have relatively higher risks of causing inability to work.
- Risks of disability increase with age for most conditions. Overall, the risk of chronic conditions causing work limitation is 2.6 times higher at ages 45-69 than at ages 18-44. Similarly, the risk of inability to work is 4.3 times higher and the risk of need for assistance in basic life activities is 3.3 times higher at ages 45-69 compared to ages 18-44.
- Diseases predominate over impairments in risks of causing inability to work among persons aged 45-69.
- Among the working-aged population, though some significant gender differences in disability risks of conditions causing work limitation are found, risks are in general quite similar by gender. Most conditions have somewhat lower risks of causing need for assistance in basic life activities among men than women. Though women report more conditions than men, risks of chronic conditions causing disability for women are equal to or higher than risks for men.
- Circulatory, skin and musculoskeletal, and selected miscellaneous conditions have higher risks than impairments of causing activity limitation among elderly persons.
- The risk of chronic conditions causing need for assistance in basic life activities increases substantially with age, especially for orthopedic impairments in a lower extremity and rheumatoid arthritis.
- The risk of chronic conditions causing activity limitation is the same for elderly men and women. Conditions occurring among elderly males are less likely to cause need for help in basic life activities compared to those among elderly females.
- Populations with specific conditions vary in demographic and other characteristics. Adjustment for population composition has more impact on some conditions, in particular mental retardation and cerebral palsy, than on others. Adjustment also has more of an impact on inability to work than on activity limitation, most likely due to the prominence of diseases with high risks at the older working ages.
- Mental illness conditions have low to moderate risks of causing disability, compared to physical health conditions. Depressive disorder, though relatively high among mental illness conditions in risk of causing disability, is exceeded in risk by many physical health conditions.

Background and Review

Disability is caused by a diversity of conditions, many of which are rare (LaPlante, 1988). About 32.5 million noninstitutionalized persons have an activity limitation caused by one or more chronic health conditions. Three conditions account for 40 percent of all conditions identified as the main cause of activity limitation: orthopedic impairments, arthritis, and heart disease (Table A). The remaining 60 percent is distributed among 44 other conditions of moderate to low prevalence. Since many chronic conditions have the potential to cause disability, comparative evaluation of disability risks should cover the broad range of chronic physical and mental health conditions that result in disability.

Several sources provide data on disability risks of chronic physical and mental health conditions. These sources differ in conditions and age groups covered, and analytic methods used. Nationally representative estimates of work disability risks of specific chronic conditions are provided by three surveys of the working-age population undertaken by the Social Security Administration (SSA): the 1966 Survey of the Disabled (Haber, 1971; 1973), the 1972 Survey of Disabled and Nondisabled Adults (Krute & Burdette, 1981), and the 1978 Survey of Disability and Work (Lando, Cutler, & Gambler, 1982). The National Health Interview Survey (NHIS) provides estimates of risk of activity limitation of physical health conditions for all ages combined (Collins, 1986; 1988). Other relevant sources, though not nationally representative, include the Epidemiologic Catchment Area (ECA) study (Wells, Golding, & Burnam, 1988) and the Medical Outcomes Study (MOS) (Stewart *et al.*, 1989).

Table A. Conditions with Highest Prevalence of Activity Limitation, All Ages: United States, 1983-1985

Main Cause	Prevalence 1,000s	%	All Causes	Prevalence 1,000s	%
All conditions	32,540	100.0	All conditions	52,718	100.0
Orthopedic impairments	5,220	16.0	Orthopedic impairments	6,987	13.3
Arthritis	4,000	12.3	Arthritis	6,130	11.6
Heart disease	3,736	11.5	Heart disease	5,575	10.6
Visual impairments	1,438	4.4	Hypertension	3,506	6.6
Intervertebral disk disorders	1,424	4.4	Visual impairments	2,900	5.6
Asthma	1,411	4.3	Diabetes	2,111	4.0
Nervous disorders	1,289	4.0	Mental disorders	1,837	3.5
Mental disorders	1,284	3.9	Asthma	1,783	3.4
Hypertension	1,239	3.8	Intervertebral disk disorders	1,699	3.2
Mental retardation	947	2.9	Nervous disorders	1,601	3.0
Diabetes	885	2.7	Hearing impairments	1,405	2.6
Hearing impairments	813	2.5	Mental retardation	1,047	2.0
Emphysema	649	2.0	Emphysema	994	1.9
Cerebrovascular disease	610	1.9	Cerebrovascular disease	939	1.8
Osteomyelitis/bone disorders	360	1.1	Abdominal hernia	595	1.1

Source: LaPlante, MP. (1988). *Data on Disability from the National Health Interview Survey, 1983-85.* An InfoUse Report. Washington, DC: U.S. National Institute on Disability and Rehabilitation Research.
Note: Nervous disorders include epilepsy, multiple sclerosis, Parkinson's disease, and other selected nervous disorders. Mental disorders include schizophrenia and other psychoses, neuroses, personality disorders, other mental illness, alcohol and drug dependency, senility, and special learning disorders (mental deficiency is not included). Content of other condition categories is described in LaPlante (1988).

Assessment of disability risks is complicated by the fact that a person with a disability may have multiple chronic conditions, some of which are not involved in the person's disability. In several of the studies referred to above, the proportion of persons with a specific chronic condition who have a disability is examined. A more appropriate estimate of risk can be calculated by estimating the number of persons with a disability said to be *caused* by a particular condition and dividing this number by the estimated number of persons with the condition (as in Haber, 1971, and Collins, 1988). It is important to determine which conditions are involved in a person's disability, otherwise disability risks of less severe conditions will be overstated if the conditions typically occur with other more severe conditions. For example, hypertension is correlated with a number of other conditions, but the risk of hypertension causing disability is low. The point is that if risk is estimated simply by calculating the proportion of persons with hypertension who have a disability, disability caused by other conditions will be misattributed to hypertension. Such bias becomes more problematic at older ages, since the prevalence of multiple conditions increases with age (Guralnik, LaCroix, Everett, & Kovar, 1989). Other factors such as genetic susceptibility and environment may also result in conditions being correlated, though their risks of disability may be substantially different.

Causal information can be incorporated into estimation of disability risks in two ways.[2] One method, *direct causal attribution*, employs judgments by affected individuals or by professionals of what conditions cause an individual's disability. Such judgments can then be aggregated to obtain an estimate of the number of cases in which a particular condition causes disability. With total prevalence for that condition as the denominator, this method provides an estimate of disability risk. *Indirect causal attribution* is another approach, in which causality is inferred from statistical association only. The proportion of persons with a disability is estimated for conditions as they occur alone and in combination with other conditions. The problem can be likened to omitted variable bias in regression analysis: the co-occurring conditions must be included to avoid omitted variable bias. By including co-occurring conditions in the model, the chance that the estimate of disability risk for a specific condition will be affected by the presence of other conditions is eliminated, or considerably reduced. Since no individual attribution of cause is employed in the latter method, the estimate of risk is based on association only and is therefore termed indirect.

With the direct method, the estimate is the frequency a particular condition is said to cause disability and the condition is the unit of analysis; in the indirect method, it is the extent to which a particular condition is associated with disability, controlling for other conditions, and the person is the unit of analysis. With either method, additional factors that influence disability risks may also be controlled. However, the indirect method requires identification of all conditions -- disabling or not -- that a person has and demands larger samples than the direct method because the number of combinations mounts quickly with the number of conditions, according to the formula

$$\text{Number of combinations} = \binom{n}{r} = \frac{n!}{(n-r)!\,r!}, \qquad (1)$$

where n is the number of conditions and r is the number of conditions making up a combination. From a list of 75 conditions, 2,775 combinations of two conditions could be produced. The direct method has the advantage of providing an adjustment for the presence of other conditions without requiring the cumbersome exploration of a large number of condition combinations. Advantages of the latter method are

[2] A number of other methods apply to experimental or longitudinal data and are not covered here, since this analysis is based on nonexperimental cross-sectional data.

that risks for conditions can be determined to be additive or synergistic, and can be used to determine the likelihood of a person having a disability given knowledge of the person's conditions and other characteristics. Whether or not the two methods provide similar estimates remains to be demonstrated. Some bias may be introduced in the direct method owing to how individual attribution of cause is made.[3]

In practice, information on co-occurring conditions is not always collected or is often ignored if collected. None of the analyses of national survey data referred to above have employed statistical adjustments for specific co-occurring conditions on disability risks (indirect causal attribution). Thus, available national estimates are based on simple percentages (no causal attribution) or the percentage of conditions causing disability (direct causal attribution). The issue of multiple conditions is often either not recognized or simply brushed aside by basing analyses on the condition indicated as the most important (i.e., the main condition). Such practice cannot be justified, since at least 40 percent of persons with disabilities have multiple conditions (LaPlante, 1988) and the prevalence of comorbidity, even in the general population, is substantial (Guralnik *et al.*, 1989). The notion of a condition as the main cause of disability is often employed for convenience and lacks conceptual justification, as does the concept of the main cause of death (Manton and Stallard, 1984). Also, analyses based only on conditions that are the main cause of disability obviously underestimate risks of disability of chronic conditions since persons with disability often identify several conditions as causes of their disability, as shown in Table A.

Despite differences in approach and focus, existing data nevertheless show some commonalities in results, and a brief review is provided below.

The 1966 Survey of the Disabled was a survey of 8,274 persons aged 18-64 with work limitation. Because the 1966 survey only sampled persons with work disability, Haber (1971) combined estimates of the number of persons with disabilities caused by specific conditions with published estimates of chronic condition prevalence among working-age adults from the National Health Interview Survey. Haber obtained estimates of risk for only eight conditions, employing only those conditions that were said to be the main cause of a person's work disability. Since persons with activity limitation often have multiple conditions, these estimates are probably low. Little comparison is afforded by the eight conditions, and the results are not discussed here.

As a way of partially overcoming the lack of information on chronic conditions that did not cause disability, Haber examined variation by condition in risks of severe work disability among conditions that caused some degree of work disability. Essentially, the question being asked is, when a condition causes work disability, how often does it cause severe work disability? About 17.2 percent of the population had a work disability and 5.9 percent had a severe work disability. Thus, about 34 percent of persons with some degree of work disability were unable to work regularly or to work at all. Although this method is less generalizable than the first, which uses the total prevalence of conditions as the risk baseline, comparisons of risk of severe disability were obtained for 29 condition categories. Haber found that the conditions most likely to cause severe work disability among persons with some degree of work disability were mental retardation, nervous system disorders (particularly stroke), and neoplasms (78.3%, 63.6%, and 54.8%, respectively).

Subsequent Social Security surveys include baseline information on chronic conditions and provide more generalizable estimates of disability risks. The 1972 Survey of Disabled and Nondisabled Adults (Krute & Burdette, 1981) sampled 18,000 persons aged 20-64, oversampling persons with a work limitation to improve statistical reliability. About 48 percent reported one or more chronic conditions. Of this group, 29.4 percent reported a work limitation. Estimates of work disability risks (based on simple percentages -- no causal attribution) were provided for 37 chronic conditions. Nervous and mental conditions were found to have the highest risks of work disability. Of the estimated 759,000 working-age persons with nervous conditions, 80.7 percent had some work limitation; 61.4 percent had a severe work disability. Among this group were about 87,000 persons with multiple sclerosis of whom 88.3 percent had some work limitation and 78.7 percent had a severe work disability. Mental retardation exhibited the highest risk of disability: of the 329,000 persons with mental retardation, 96.1 percent were limited in work and 76.6 percent had a severe work disability. Of the 629,000 persons with mental illness, 79.7 percent had some work disability. The lowest risk of work disability was observed among 7.6 million persons with nonrespiratory allergies (15.1%). With these results, an inverse relationship between prevalence of conditions and disability risks begins to emerge. However, conditions were simply linked to whether a person had a disability. Since it was not ascertained whether conditions cause disability, certain estimates of disability risks may be high.

Estimates of the percentage of persons with work disability (apparently based on simple percentages) have been reported only for broad classes of conditions from the 1978 Survey of Disability and Work (although the detail of condition information collected was comparable to the 1972 survey) and are not useful for comparing specific conditions. However, the data show that classes of nervous and mental disorders were more likely than other classes of conditions to be associated with work disability (Lando *et al.*, 1982).

Using data from the 1979-1980 National Health Interview Survey (NHIS), Collins (1986) provides estimates of the proportion of chronic conditions that cause activity limitation, either as a main or secondary cause. In the NHIS, cause of disability is based on respondent attribution. Also, using data from the 1983-1985 NHIS, Collins (1988) presents a ranking of the twelve conditions with the highest proportion causing activity limitation. For all ages combined, of 109 specific chronic conditions tabulated, mental retardation ranked first in terms of risk of activity limitation (85.6%), followed by multiple sclerosis (76.8%), and cancer of the lungs and bronchus (68.2%) Estimates of risk were not provided by age or specific type of disability, nor were they adjusted for sociodemographic characteristics.

[3] The extent of such bias can only be conjectured. Survey respondents may use knowledge of etiology or impact on functioning in determining which conditions cause disability. Hypertension, for example, may be ignored by a respondent as a cause of disability when assessed solely in terms of its impact on functioning, but may be mentioned by respondents who know that it is a cause of other conditions they may have, such as heart disease.

The analyses discussed above show that chronic conditions vary considerably in risk of disability. It may also be generalized that the most common types of chronic conditions have low disability risks, while conditions that are least common have the highest risks of disability. There appears to be agreement that nervous and mental conditions exhibit the highest risks of activity limitation and of work disability.

With the exception of Haber (1971), the studies mentioned above were not primarily concerned with assessing the risks of disability for specific conditions, but did so incidentally to other purposes and have some shortcomings. The SSA surveys were limited to the working-age population. Collins examined risks at all ages but only for activity limitation, which is just one among several measures of disability. Stewart *et al.* (1989) examined disability risks (role function) of nine chronic conditions using data from the Medical Outcomes Study (MOS), but because the range for comparison is limited, these results are not discussed in detail here.[4] Risks of activity limitation of mental health conditions have been investigated using data from the Epidemiologic Catchment Area (ECA) study (Wells, Golding, & Burnam, 1988) and the MOS (Wells *et al.*, 1989). These results are covered in the discussion section of this report.

None of the studies mentioned above examined risks of assistance needs in basic life activities, measures increasingly important because of the aging of the U.S. population. Most studies fall far short of being comprehensive in terms of the conditions studied. A better understanding of the disability risks of chronic conditions is needed -- one that addresses the major types of disability across the lifespan and is based on a comprehensive classification of conditions. That is the purpose of the present analysis.

Data Sources, Methods, and Limitations

From the perspective of epidemiology, risk is the probability that some (usually unfavorable) event will occur within a defined time period (Friedman, 1987; Last, 1988). Risk is often considered to be conditional in that the probability of an event happening depends on the occurrence of some other predisposing event, such as exposure to a risk factor, or in this case, an underlying condition. Risk is often measured with respect to the amount of time following onset of a condition (Manton & Stallard, 1988) since the probability of an event, such as disability, increases with the progression of many conditions. In the present study, as in certain of the ones discussed above, risk is measured as the proportion of persons with a condition who have a disability *caused* by that condition, based on respondent attribution of cause. This measure provides a simple way of comparing risks that various health conditions cause disability. A more comprehensive assessment would also take into account institutional and mortality selection, but would require data beyond the scope of the present analysis.

Estimates of disability risk are based on data from the National Health Interview Survey (NHIS), a continuing household survey of the noninstitutionalized population of the United States. The NHIS is the most comprehensive source of information on the prevalence of chronic illness, impairment, and disability in the noninstitutional population of the United States. Because the prevalence of chronic conditions and the risk of disability are, in general, inversely related, a comprehensive assessment of the risks of disability from chronic conditions must employ a sample sufficiently large to cover rare events. The present analysis is based on four years (1983-1986) of NHIS chronic condition data (estimates are annual averages). Each year, about 120,000 persons are interviewed, although in 1985 and 1986, the sample size was diminished due to budgetary reductions (approximately a three-quarter sample in 1985 and a half sample in 1986). The combined data set for the four years includes 101,703 condition records.

Information on chronic conditions is obtained in the NHIS through six checklists, five of which list conditions associated with a particular body system (skin and musculoskeletal, digestive, circulatory, respiratory, and a miscellaneous category, consisting of genitourinary, nervous, endocrine, metabolic, and blood forming systems). A sixth checklist includes impairments defined as functional or structural musculoskeletal and neuromuscular abnormalities and other abnormalities of visual and auditory senses, speech, and intelligence (NCHS, 1987a). One checklist is assigned randomly to each household; therefore, analysis of co-occurring conditions covered by the other checklists is precluded. In addition, the survey obtains more specific information about the name of the condition and part of the body affected, if known to the respondent. This information is used in coding conditions to the International Classification of Diseases (ICD). The NHIS employs an alternative classification for impairments which are not covered by the ICD. Separate weights are used to inflate data from the checklists to provide national prevalence estimates. For more information on the general survey design and procedures for estimating the prevalence of chronic conditions, see LaPlante (1988) or Schoenborn and Marano (1988).

In the NHIS, respondents are asked if they have an activity limitation and if so, what condition (or conditions) causes it. Respondents are later asked whether they have conditions included on the assigned checklist. Thus, for each checklist condition, estimates of risk of disability (activity limitation, work disability, or need for assistance in basic life activities) can be produced by dividing the number of persons with a disability *caused* by the condition by the number of persons with the condition. This analysis is based only on the checklist conditions, and some conditions that occur among persons with disabilities are not included, in particular mental illness conditions, cognitive diseases, and cancer of certain sites. All checklist conditions mentioned as causing disability are considered in this analysis, not just those said to be the main cause.

Comparative analysis of risks of disability from chronic conditions is affected by the classification of conditions used. In general, a condition must have been first noticed at least 3 months prior to the interview to be considered chronic; however, certain conditions that have long presymptomatic periods or are unlikely to be completely cured -- arthritis and diabetes, for example -- are considered chronic regardless of time of onset (Schoenborn and Marano, 1988). In this analysis, conditions are classified using two recodes (recodes "B" and "C") of the ICD and impairment classification available on the

[4] Chronic conditions included were hypertension, diabetes, congestive heart failure, myocardial infarction, arthritis, chronic lung problems, back problems, and angina.

NHIS public use data tapes. Recode C permits tabulation of 134 separate chronic conditions for which NCHS considers it acceptable to estimate prevalence from the NHIS. Only conditions included on Recode C are used in the present analysis; however, conditions too low in prevalence to be statistically reliable were regrouped into a residual category within each of the six checklists. Certain highly related conditions, such as specific disorders of heart rhythm, were combined into larger aggregates. Recode B was used to distinguish rheumatoid arthritis from osteoarthritis for which risks of disability are significantly different. Conditions with estimated risk of activity limitation too low to be reliable for all ages combined were also regrouped into a residual category within each checklist.[5,6] Reliable estimates of disability risk were obtained for 62 chronic condition categories for all ages combined.

The major types of disability included in the present analysis are activity limitation, major activity limitation, work limitation, and need for assistance from another person in basic life activities. Limitation includes inability to perform an activity or restrictions in the kind or amount of activity. Major activity refers to the principal roles associated with a person's age group: *usual play* for children under age 5, *going to school* for children aged 5-17, and *working at a job or business or keeping house* for adults aged 18-69. NCHS also considers major activity for persons aged 70 and over to be performance of *basic life activities*, although such activities are not actually roles. A residual category is defined for all ages for limitations in activities that are considered normal but not major, which include recreational and community activities. The category *activity limitation*, the broadest measure of disability, includes limitations in major and non-major activity.

In the NHIS core questionnaire, the need for assistance in basic life activities is assessed by two questions: whether persons "need the help of other persons with their personal care needs, such as eating, bathing, dressing, or getting around their home" and if not, whether they "need the help of other persons in handling routine needs such as everyday household chores, doing necessary business, shopping, or getting around for other purposes." The first question includes ambulation with activities of daily living (ADL) and the second refers to selected instrumental activities of daily living (IADL). Although the reliability and validity of the single-question approach requires further study, the NHIS yields estimates of numbers of persons with assistance needs in basic life activities that are comparable to several other surveys, including those which ask separately about each of the basic life activities (LaPlante, 1988). The need for assistance in basic life activities is ascertained for persons aged 5-59 if they report having any activity limitation and for all persons aged 60 and over. The need for assistance in IADL is not ascertained for children under age 18.

[5] Although Collins (1988) provided prevalence estimates for 109 conditions based on Recode C that were statistically reliable, for many of these, estimates of risks of activity limitation are not reliable.

[6] Such conditions include hemorrhoids, deviated nasal septum, tonsillitis, laryngitis, pleurisy, tuberculosis, gallstones, indigestion, spastic colon, diverticula, constipation, absence of breast, cleft palate, non migraine headache, sebaceous cysts, acne, dry skin, ingrown nails, corns and calluses, sciatica, bunions, gout, goiter, thyroid diseases, bladder conditions, and several others.

Large sample size, comprehensive classification of conditions, and several measures of disability are distinct advantages of the NHIS; however, it has some disadvantages. The NHIS is based only on persons living in the community and does not include persons who are institutionalized or who have died. As a result, some bias is introduced in this analysis, which may be important for conditions with high institutionalization or mortality rates.

In community surveys, certain chronic conditions are underreported as compared to professional assessment (Jabine, 1987). Underreporting occurs for both physical and mental conditions (Ashbaugh, Leaf, Manderscheid, & Eaton, 1983). Methodological studies have found reporting more consistent between respondents and professionals when conditions have an impact on the respondent, such as for conditions that cause hospitalization or activity limitation. Therefore, risks of disability for specific conditions as measured by community surveys may to some extent be overestimated because conditions with little impact are more likely to be underreported. The last disadvantage is that the NHIS does not cover prevalence of mental health conditions. This issue is treated in the discussion section of this report.

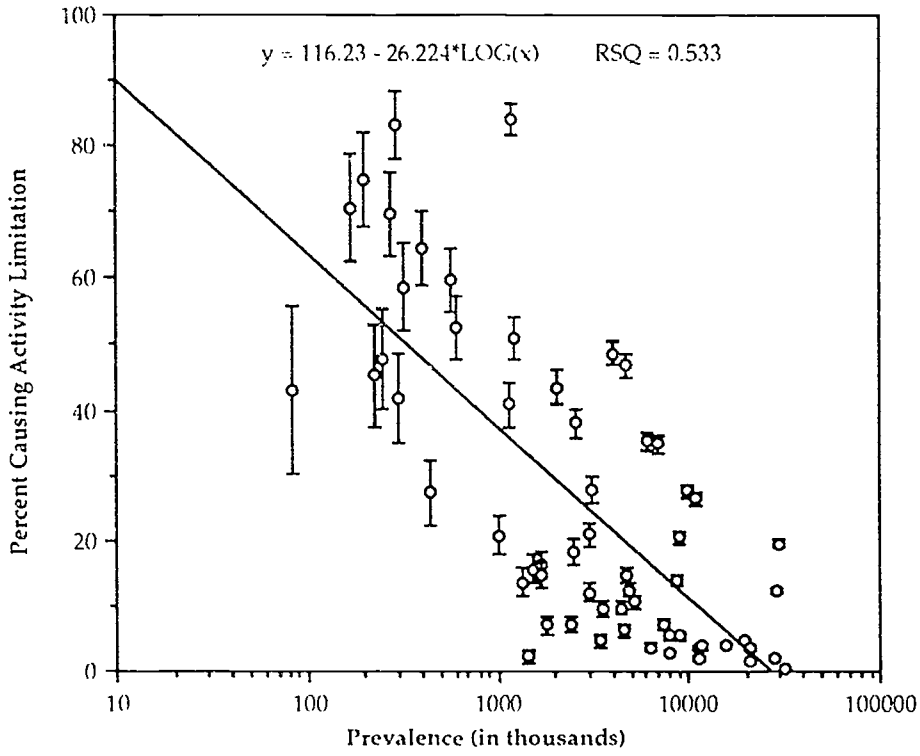
Estimates of disability risk unadjusted for demographic and social characteristics (i.e., crude estimates) are presented and compared for various chronic conditions for all ages combined, and separately for children, working-age persons, and elderly persons. Adjusted estimates of risk based on multivariate logistic regression models that control for demographic and social characteristics are presented and compared to crude risk estimates. The NHIS is a complex stratified cluster sample, and special methods are used to determine statistical errors of estimates as described in Appendix A. Tests of differences in crude estimates of risk are based on t-tests for percentages (two-tailed).

Results

Disability Risks at All Ages

Table 1 presents crude estimates for all ages combined of the number of persons with specific chronic conditions and the percent of conditions that cause limitation in any activity, limitation in major activity, and need for assistance from another person in basic life activities. About 11.7 percent of conditions identified in the NHIS cause activity limitation, the broadest measure of disability. Considering the major groups of conditions, impairments have the highest risks of disability, followed by circulatory, skin and musculoskeletal, miscellaneous, digestive, and respiratory conditions. This pattern holds regardless of the type of disability.

The risk of disability is inversely related to the prevalence of chronic conditions. Conditions high in prevalence typically have low risks of disability, while conditions low in prevalence typically have high risks of disability. Disability risks for most conditions are only approximated by this empirical generalization which is depicted in Figure 1, fit to a logarithmic curve. Disability risks for the the five most and five least prevalent conditions are shown in Figure 2. Osteoarthritis and hypertension, the second and third most prevalent conditions, have higher risks than the other high prevalence conditions. Multiple sclerosis and lung and bronchial cancer have higher risks than the other low prevalence conditions.



Note: error bars represent 67 percent confidence intervals (estimate +/- SE).

Figure 1. Percent of specific chronic conditions causing activity limitation, by prevalence: U.S., 1983-86

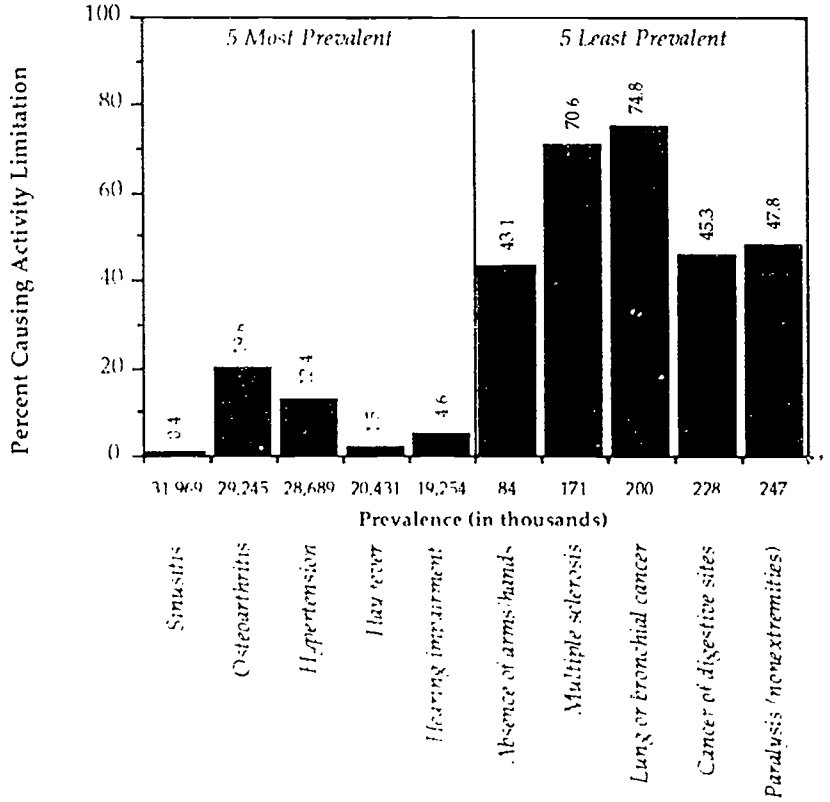


Figure 2. Percent of specific chronic conditions causing activity limitation for the five most prevalent and five least prevalent conditions: U.S., 1983-86

Table B. Conditions with Highest Risk of Disability, by Type of Disability, All Ages: United States, 1983-1986

Chronic Condition	Number of Conditions (1,000s)	Percent Causing Activity Limitation	Rank	Percent Causing Major Activity Limitation	Rank	Percent Causing Need for Help in Basic Life Activities	Rank
Mental retardation	1,202	84.1	1	80.0	1	19.9	9
Absence of leg(s)	289	83.3	2	73.1	2	39.0	2
Lung or bronchial cancer	200	74.8	3	63.5	3	34.5	4
Multiple sclerosis	171	70.6	4	63.3	4	40.7	1
Cerebral palsy	274	69.7	5	62.2	5	22.8	8
Blind in both eyes	396	64.5	6	58.8	6	38.1	3
Partial paralysis in extremity	578	59.6	7	47.2	7	27.5	5
Other orthopedic impairments	316	58.7	8	46.2	8	14.3 *	12
Complete paralysis in extremity	617	52.7	9	45.5	9	26.1	6
Rheumatoid arthritis	1,223	51.0	10	39.4	12	14.9	11
Intervertebral disk disorders	3,987	48.7	11	38.2	14	5.3	—
Paralysis in other sites (complete/partial)	247	47.8	12	43.7	10	14.1 *	13
Other heart disease/disorders†	4,708	46.9	13	35.1	15	13.6	14
Cancer of digestive sites	228	45.3	14	40.3	11	15.9 *	10
Emphysema	2,074	43.6	15	29.8	—	9.6	15
Absence of arm(s)/hand(s)	84	43.1	—	39.0	13	4.1 *	—
Cerebrovascular disease	2,599	38.2	—	33.3	—	22.9	7

* Figure has low statistical reliability or precision (relative standard error exceeds 30 percent).

† Heart failure (9.8%), valve disorders (15.3%), congenital disorders (15.0%), all other and ill-defined heart conditions (59.9%).

Source: National Health Interview Survey, 1983-1986. Data are estimates (annual averages) based on household interviews of the civilian noninstitutionalized population.

Note: ICD and impairment codes are provided in Appendix B.

Conditions are ranked by crude risk of disability for each type of disability, and the rankings for the fifteen highest risk conditions are presented in Table B. Because impairments are defined as abnormalities of structure or function, it is expected that many impairments would have relatively high risks of disability. But chronic diseases also have relatively high risks of disability, several with risks exceeding some impairments. Of the fifteen conditions with the highest risks of activity limitation, six are diseases. Mental retardation ranks first (84.1%), though it is not the least prevalent condition. Absence of one or both legs and lung cancer rank second and third highest in risk (83.3% and 74.8%, respectively). Multiple sclerosis ranks fourth (70.6%), followed by cerebral palsy (69.7%). Partial paralysis in one or more extremities has a slightly higher risk than complete paralysis in one or more extremities (59.6% versus 52.7%, t=1.0), but the difference is not statistically significant. Based on examination of detailed impairment codes, the vast majority of cases of absence, paralysis, and orthopedic impairments of extremities involves one extremity. Risks of activity limitation for ischemic heart disease are lower than for other heart disease (35.0% versus 46.9%, t=5.5, p<.01).

The prevalence of a disabling condition (i.e., one that has caused a disability in an individual, as in Table A) is a function of the prevalence of the condition in the general population and the risk the condition causes disability. For example, the prevalence of disabling conditions increases with age because certain chronic conditions become more prevalent with age, but also because for many conditions the risk of their causing disability increases with age. Thus, the prevalence ranking of disabling conditions at different ages is sensitive to age variation both in the prevalence of conditions and their disability risk. Of the 32.5 million persons with activity limitation, the most frequent disabling disease is arthritis, of which osteoarthritis is the major component (Table A). Osteoarthritis does not have a high risk of causing activity limitation compared to most other conditions, but it is highly prevalent in the general population. The second most common disease as a cause of activity limitation is heart disease (including rheumatic heart disease, ischemic heart disease, heart rhythm disorders, and other heart disease), which is somewhat less prevalent than osteoarthritis (20.6 versus 29.2 million), but somewhat more disabling (26.3% versus 19.6%). Hypertension, which is almost as prevalent in the general population as osteoarthritis (28.7 million), has only two-thirds the risk of causing activity limitation of osteoarthritis (12.4%). Though hypertension does not rank highly in risk of causing activity limitation, it is the third-ranked disabling disease condition among persons with activity limitation (considering main and secondary causes). Thus, the top three disabling diseases owe their position to their high prevalence, not that they are highly likely to cause individuals to have disabilities. The inverse relationship of disability risk with condition prevalence describes how it is that persons with disabilities have such a variety of conditions that cause their disabilities.

When risk of limitation in major activity is considered, the ranking of conditions remains about the same as for any activity limitation, and the percentages are only slightly lower. Thus, conditions with high risk of activity limitation also have high risks of major activity limitation.

The need for assistance in basic life activities is a less frequent and more severe form of disability than activity limitation. Overall, 2.6 percent of all conditions cause need for assistance in basic life activities. Conditions with the highest risk of activity limitation do not necessarily have the highest risk of causing need for assistance in basic life activities.

Multiple sclerosis moves from fourth in risk of activity limitation to first in risk of need for assistance in basic life activities. Mental retardation moves from first in risk of activity limitation to ninth in risk of assistance needs in basic life activities. Blindness moves from sixth to third place. Cerebrovascular disease, which is not among the conditions with highest risk of activity limitation, is ranked seventh in risk of assistance needs in basic life activities. In general, neurological conditions and conditions that severely restrict ambulation and movement of extremities seem most likely to interfere with performing basic life activities.

The category "other heart disease" appears to have higher risks of disability than ischemic heart disease. Based on an examination of detailed ICD codes for the other heart disease category, the groups with highest risk of activity limitation are heart failure and ill-defined heart conditions (57.0% and 60.6%, respectively). Ischemic heart disease includes mainly angina and past heart attacks, conditions that, with medical treatment, may allow resumption of normal activity. Heart failure is associated with shortness of breath and lack of endurance, has a poorer prognosis, and in many cases activities must be reduced to a sedentary level. Also, due to poor circulation, extremes of temperature must be avoided, and outdoor activities may not be possible in some climates (Brammel, 1981). That so-called ill-defined heart conditions have high risks of disability indicates that some persons do not provide information sufficient to classify their condition more accurately, not that they are reporting minor heart ailments. Heart failure or ill-defined heart conditions are also much more likely to cause need for assistance in basic life activities than any other heart condition category, including ischemic heart disease (risks of 26.8% and 18.2%, respectively). Valve disorders and congenital heart conditions have lower disability risks than heart failure and ill-defined conditions.

Risks of activity limitation overall are slightly higher for conditions among males than females. Among males, 12.5 percent of chronic conditions result in activity limitation compared to 11.2 percent among females ($t=5.3$, $p<.001$). Similarly, 9.4 percent of chronic conditions cause major activity limitation among males compared to 7.9 percent among females ($t=7.0$, $p<.001$). However, the pattern reverses for basic life activities. Overall, 2.0 percent of chronic conditions cause need for assistance in basic life activities for males compared to 3.1 percent for females ($t=9.4$, $p<.001$).

These overall gender differences in disability risks of chronic conditions are influenced by gender differences in prevalence of specific conditions as well as differences in risks of specific conditions. Overall, females report 40 percent more chronic conditions than males. Furthermore, gender differences in prevalence vary considerably by condition. Anemias, phlebitis/varicose veins, and migraine headaches are reported relatively most often by females (ratios of female to male prevalence are 5.2, 4.0, and 2.9, respectively). Conditions reported relatively most often by males are pneumoconiosis and asbestosis, and absence of arm(s) or hand(s), and absence of leg(s) (ratios of male to female prevalence are 15.7, 13.0, and 4.2, respectively). Since the ratio of female to male reporting is not constant over conditions, when data is aggregated into larger categories, gender differences in prevalence will influence gender differences in disability risk.

For example, circulatory conditions have a significantly higher risk of activity limitation among males than females (15.9% versus 14.4%, $t=2.4$, $p<.05$). To correct for gender differences in prevalence, we can take the prevalence for both genders as the standard to which estimates of risk for males may be applied to obtain a prevalence-adjusted risk. The process is repeated for females. The result, however, is that the prevalence adjusted risks for all circulatory conditions are 14.6% for males and 15.4% for females, leading to the different conclusion that circulatory conditions have a higher risk of activity limitation among females.

To avoid such bias, it is preferable to compare specific conditions in risks of disability by gender. Significantly lower risks of activity limitation among males are observed for osteomyelitis, other visual impairments/retinal disorders, hypertension, and anemias (range of differences in percentages is 3.7 to 8.9, t-values from 2.4 to 4.0, significance level $p<.05$ or higher). Risk of activity limitation is significantly higher among males only for other skin and musculoskeletal conditions (2.8% versus 1.6%, $t=2.8$, $p<.01$).

Somewhat more variation is observed by gender in risks of chronic conditions causing limitation in major activity. Risks of major activity limitation are considerably higher among males than females for paralysis in other than an extremity (60.0% versus 23.0%, $t=2.7$, $p<.01$) and blindness (70.5% versus 47.8%, $t=2.0$, $p<.05$). Significant, but smaller differences in risks of major activity limitation are observed by gender for other visual impairments/retinal disorders, other skin and musculoskeletal conditions, ulcers, hypertension, and phlebitis and varicose veins (in both directions -- largest absolute difference in percentages is 4.9, $t=3.1$, $p<.01$).

In sum, gender differences in risks of activity limitation of chronic conditions are typically small, especially with respect to differences in risks between conditions, and no consistent pattern is apparent. Risks of conditions causing need for assistance in basic life activities is a different matter. For sixteen conditions, risks of need for assistance in basic life activities are significantly lower among males than females. The largest differences are observed for rheumatoid arthritis (4.4% versus 18.7%, $t=3.5$, $p<.01$), ischemic heart disease (4.4% versus 13.0%, $t=5.3$, $p<.001$), and epilepsy (2.2% versus 10.5%, $t=2.6$, $p<.01$). For practically every condition, risks are lower among males than females. For no condition was the risk significantly higher among males than females. Thus, chronic conditions are generally less likely to cause males to need assistance in basic life activities. This may be related to gender differences in the level of impairment, which may be correlated with differences in age. Risks of disability are explored for children, working-age adults, and elderly persons in the next three sections.

Disability Risks in Childhood

Overall, 8.6 percent of conditions among children cause activity limitation, 6.1 percent cause limitation in major activity, and 0.3 percent cause help to be needed in activities of daily living. Condition categories employed in the NHIS include many conditions that have very low prevalence among children.[7] Therefore, estimates of disability risks for all specific conditions among children are not presented. However, disability risks were estimated for specific conditions

[7] In view of this limitation, special supplements on child health have been conducted recently in the NHIS.

Table C. Conditions with Highest Risk of Disability, by Type of Disability, Children Under Age 18: United States, 1983-1986

Chronic Condition	Number of Conditions (1,000s)	Percent Causing Activity Limitation	Rank	Percent Causing Major Activity Limitation	Rank	Percent Causing Need for Help in Activities of Daily Living	Rank§
Mental retardation	661	89.7	1	87.1	1	5.9 *	2
Cerebral palsy	108	73.8	2	59 8	2	13.2 *	1
Epilepsy	332	38.2	3	23.9	4	1.6 *	4
Diabetes	119	35.3	4	11.9 *	9	0 0	
Other selected impairments	115	30.8 *	5	23.4 *	5	0 0	
Deaf in both ears	102	30.6 *	6	22.5 *	6	0.0	
Orthopedic impairment in upper extremity	132	27.0 *	7	9.4 *	13	0 0	
Speech impairments	1,094	26.2	8	25.8	3	0.0	
Other heart disease/disorders†	287	21.3	9	11.9 *	10	0.0	
Asthma	2,926	19.7	10	12.9	7	0.1 *	
Osteomyelitis/bone disorders	132	18.2 *	11	9.6 *	12	0 0	
Orthopedic impairment in lower extremity	1,258	16.8	12	4.1 *	—	0.5 *	
Absence of fingers, toes, feet	70	16.1 *	13	10.3 *	11	0.0	
Hypertension	138	14 6 *	14	12.0 *	8	0 0	
Kidney disorders	262	12.3 *	15	8.2 *	15	0.0	
Osteoarthritis/other arthropathies	113	11.2 *	—	8 5 *	14	3 3 *	3
Other visual impairment/eye disorders	656	10.3	—	5 8 *	—	1.4 *	5

* Figure has low statistical reliability or precision (relative standard error exceeds 30 percent).
† Valve disorders (6%), congenital disorders (70%), all other and ill-defined heart conditions (24%).
§ Ranking includes only the five conditions with the highest risk due to low statistical reliability of estimates.
Source: National Health Interview Survey, 1983-1986. Data are estimates (annual averages) based on household interviews of the civilian noninstitutionalized population.
Note: ICD and impairment codes are provided in Appendix B.

and ranked in terms of highest risk. Results are shown in Table C.

Almost 90 percent of children with mental retardation are limited in activity as a result of that condition, which ranks first, followed by cerebral palsy. Epilepsy and diabetes are two diseases which rank next highest in risk of causing activity limitation, although the level of risk is roughly half that of mental retardation and cerebral palsy. Other selected impairments, which consist mainly of cleft palate and spina bifida (64% and 24% of total, respectively), rank next in risk. Most of the high risk conditions among children are different from those with high risks at all ages. Only three conditions with the highest risks of causing activity limitation (mental retardation, cerebral palsy, and other heart disease) appear on the list of conditions with highest risks for all ages combined. Osteomyelitis/bone disorders, which rank eleventh in risk of causing activity limitation, are composed solely of osteoporosis and other osteochondropathies. These conditions may be associated with nutritional deficiencies in childhood. In general, these results confirm that the epidemiology of disability is very different for children than for adults.

Among children, conditions with the highest risks of causing major activity limitation are generally the same as those with the highest risks of causing any activity limitation, but their relative risks change. Diabetes and orthopedic impairment in an upper extremity drop in relative risk. Diabetes and orthopedic impairment in an upper extremity limit extracurricular activities more than they limit school activity. Speech impairments rank more highly in risk of causing limitation in school-related activities than in risk of causing limitation in extracurricular activities. More than other conditions, mental retardation and speech impairments limit school-related activities more than they limit extracurricular activities.

Risks of conditions causing need for help in activities of daily living (ADL) are generally low among children. Cerebral palsy ranks first in risk, and about 13 percent of cases cause need for help in ADL. Mental retardation ranks next highest, followed by osteoarthritis/other arthropathies, epilepsy, and other visual impairments. These estimates of risk have low statistical reliability, however, and merely suggest these conditions have high risks of causing need for help in ADl among children.

The prevalence of chronic conditions is slightly higher for boys than girls (17.8 versus 17.2 million). Conditions among boys are more likely than those among girls to cause limitation in activity (9.7% versus 7.6%, t=3.0, p<.01), or to cause major activity limitation (7.3% versus 4.9%, t=4.0, p<.001), parallel to gender differences for all ages combined. Risks of conditions causing need for help in ADL are not different by gender. No significant gender differences in disability risks for specific conditions among children are found, but there is little statistical power to detect gender differences among children.

Disability Risks in Midlife

In this section, risks of disability in the working ages are examined. The focus, as shown in Table 2, is on more severe disability in this age group, namely, any limitation in work (which includes limitation in the amount or kind of work or inability to work), inability to work, and need for assistance in basic life activities. In the 18-69 age group, 8.6 percent of all reported chronic conditions cause some work limitation, 5.4 percent cause inability to work, and 1.3 percent cause need for

Table D. Conditions with Highest Risk of Disability and Rank Order, by Type of Disability, Ages 18-69: United States, 1983-1986

Chronic Condition	Number of Conditions (1,000s)	Percent Causing Work Limitation	Rank	Percent Causing Inability to Work	Rank	Percent Causing Need for Help in Basic Life Activities	Rank
Mental retardation	520	75.3	1	53.1	4	37.4	2
Absence of leg(s)	207	72.9	2	54.9	3	32.7	3
Lung or bronchial cancer	99	72.7	3	69.9	1	17.6 *	8
Blind in both eyes	180	71.9	4	58.6	2	26.7	5
Multiple sclerosis	155	58.9	5	44.6	7	37.5	1
Cerebral palsy	157	58.2	6	46.7	5	28.0 *	4
Partial paralysis in extremity	336	55.0	7	46.6	6	22.2	6
Absence of arm(s)/hand(s)	64	51.6	8	18.0 *	—	5.4 *	—
Complete paralysis in extremity	421	50.8	9	39.8	8	21.9	7
Cancer of digestive sites	143	46.8	10	39.6	9	11.1 *	10
Paralysis in other sites (complete/partial)	196	42.0	11	24.1	—	9.5 *	12
Intervertebral disk disorders	3,616	40.7	12	19.1	—	4.6	—
Rheumatoid arthritis	969	40.1	13	26.5	—	9.7	11
Other heart disease/disorders†	2,800	39.9	14	29.2	12	4.9	—
Other orthopedic impairments	247	39.5	15	23.3	—	7.9 *	13
Pneumoconiosis/asbestosis	252	35.9	—	34.7	10	2.9 *	—
Epilepsy	762	37.0	—	30.6	11	6.7 *	15
Cancer of genitourinary sites	234	29.3	—	28.3	13	1.7 *	—
Emphysema	1,399	38.7	—	28.1	14	7.0	14
Cerebrovascular disease	1,334	32.5	—	28.1	14	14.1	9

* Figure has low statistical reliability or precision (relative standard error exceeds 30 percent).

† Heart failure (6.3%), valve disorders (18.8%), congenital disorders (15.8%), all other and ill-defined heart conditions (59.1%).

Source: National Health Interview Survey, 1983-1986. Data are estimates (annual averages) based on household interviews of the civilian noninstitutionalized population.

Note: ICD and impairment codes are provided in Appendix B.

assistance in basic life activities. In terms of major condition groups, impairments have the highest risks of causing work limitation or need for assistance in basic life activities, but circulatory conditions have the highest risks of causing inability to work.

Specific conditions with the highest risks of disability in this age group are shown in Table D. Mental retardation exhibits the highest risk of causing work limitation as it does for causing activity limitation among children. Only three other conditions with high risks of causing activity limitation among children appear on the list of conditions with high risks of causing work limitation among working-aged persons: cerebral palsy, other heart disease, and epilepsy. Conditions with the highest risks of work limitation are the same as those with the highest risks of major activity limitation for all ages combined, and only absence of arm(s) or hand(s) and other orthopedic impairments rank differently.[8]

Several diseases emerge with relatively high risks of causing inability to work: pneumoconiosis and asbestosis, epilepsy, cancer of genitourinary sites, emphysema, and cerebrovascular disease. In terms of major condition categories, impairments are second to circulatory conditions in risk of causing inability to work. Of the fifteen conditions with the highest risks of causing inability to work, nine are diseases. Lung cancer is the top-ranked condition causing inability to work. Absence of arm(s) or hand(s) and intervertebral disk disorders have risks of causing limitation in the amount and/or kind of work that exceed risks of causing inability to work. These impairments are more likely to cause changes in jobs or reduction of hours, but are less likely to prevent work.

Chronic diseases also rank highly in risks of causing need for assistance in basic life activities. Of the fifteen conditions with the highest risks of causing need for assistance in basic life activities, seven are chronic diseases. Multiple sclerosis has the highest risk of causing need for assistance in basic life activities, consistent with results for all ages. Mental retardation ranks second in risk of causing need for assistance in basic life activities in the 18-69 age group, but ranks ninth for all ages combined. Cerebral palsy ranks eighth in risk of causing need for help in basic life activities at all ages combined but ranks fourth among persons aged 18-69. This pattern probably results from the different definition of basic life activities which for adults includes both ADL and IADL,

[8] Absence of arm(s) or hand(s) ranks eighth in risk of work limitation, though it ranks thirteenth in risk of major activity limitation at all ages. Other orthopedic impairments (other than of the back or an extremity) ranks fifteenth in risk of work limitation, but ranks eighth in risk of major activity limitation at all ages. Upon further examination, it was found that persons with other orthopedic impairments are somewhat younger than persons with absence of arm(s) or hand(s) (mean ages are 44.9 versus 55.4 years), but that persons with such absence had a longer duration with the impairment (91% versus 48% with duration more than 5 years). This may mean that persons with absence of arm(s) or hand(s) experience more difficulty working as they grow older, compared to persons with other orthopedic impairments. However, the latter category includes persons with other orthopedic impairments caused by injury that are not classifiable to the back or the extremities, such as injuries to the neck and trunk. Such injuries may be more common among young adults, and though they may result in severe limitations, they are perhaps minor compared to absence of arm(s) or hand(s).

but for children only includes ADL. This would also explain why, for all ages combined, mental retardation and cerebral palsy rank lower for assistance in basic life activities than they do for limitation in other activities.

Chronic diseases are often associated with gradual physiological decrements occurring over an extended period of time. Therefore, risks of disability for chronic diseases are expected to increase with age. Risks of disability from impairments may also vary with age, in part because the factors that precipitate them change with age and have different implications for risk of disability. Based on analysis of impairment etiology codes in the NHIS, 20.9 percent of impairments among children (under 18 years) have congenital involvement and 8.6 percent are due to injury. A small percentage have involvement of selected diseases (see footnote 9). Impairments with congenital involvement have higher risks of causing activity limitation than those due to injuries in children (35.5% versus 21.2%). About 34.9 percent of impairments among persons aged 18-44 involve injuries and only 9.1 percent are congenital. Impairments with congenital involvement are slightly more disabling than those due to injuries at ages 18-44 (29.3% versus 22.4%). Impairments at the older ages have more involvement of diseases such as stroke and diabetes (4.7% at ages 70 and over), which have high risks of causing activity limitation (about 40%) and need for assistance in basic life activities (about 30%).

Overall, the risk of chronic conditions causing work limitation is 2.6 times higher at ages 45-69 than at ages 18-44. Similarly, the risk of inability to work is 4.3 times higher and the risk of need for assistance in basic life activities is 3.3 times higher at ages 45-69 compared to ages 18-44. The term *age ratio* is defined here as the ratio of the risk of disability for ages 45-69 to ages 18-44. Respiratory conditions have the highest age ratios: 4.4 for any work limitation, 12.0 for inability to work, and 9.0 for need for assistance in basic life activities. They are followed by circulatory, miscellaneous, skin and musculoskeletal, and digestive conditions. Impairments have the lowest age ratios of disability: 1.2 for any work limitation, 1.8 for inability to work, and 1.7 for need for assistance in basic life activities. These data present an interesting contrast: on average, impairments have the highest risks of disability but do not change much with age while respiratory conditions have the lowest risks of disability but change the most with age. As a result of the higher rate at which circulatory conditions increase with age, they exceed impairments in risk of causing work disability at ages 45-69.

The list of conditions with the highest risks of causing disability changes with age (Table E). Mental retardation has the greatest risk of causing work limitation at ages 18-44 and is second at ages 45-69, and the level of risk does not change substantially. Blindness in both eyes has the greatest risk of causing work limitation at ages 45-69, moving up from fourth at ages 18-44, and the level of risk increases by 20 percent. It is possible that newly incident cases of blindness at the older ages are more disabling than those occurring earlier in life. A general pattern that emerges is that diseases have relatively prominent risks of causing disability at the older working ages. Of the ten conditions with highest risks of causing work limitation, among persons aged 18-44, two are diseases while among persons aged 45-69, six are diseases. Pneumoconiosis/asbestosis is not disabling at ages 18-44, but is ranked sixth highest in risk of causing work limitation at ages

Table E. Conditions with Highest Risk of Work Limitation and Rank Order, by Age: United States, 1983-1986

	Ages 18-44			Ages 45-69			
Chronic Condition	Number of Conditions (1,000s)	Percent Causing Work Limitation	Rank	Number of Conditions (1,000s)	Percent Causing Work Limitation	Rank	Age Ratio
Mental retardation	393	75.9	1	127	73.6	2	1.0
Complete paralysis in extremity	133	65.8	2	288	43.9	13	0.7
Partial paralysis in extremity	94	64.0	3	242	51.5	7	0.8
Blind in both eyes	76	63.2	4	105	78.2	1	1.2
Cerebral palsy	134	55.7	5	23 *	72.9 *	—	1.3
Multiple sclerosis	72	48.2	6	82	68.3	5	1.4
Intervertebral disk disorders	1,659	37.8	7	1,957	43.2	14	1.1
Other orthopedic impairments	133	37.6	8	114	41.9	15	1.1
Paralysis in other sites (complete/partial)	64	36.9 *	9	132	44.4	11	1.2
Rheumatoid arthritis	252	34.8	10	716	41.9	15	1.2
Epilepsy	535	34.0	11	227	44.0	12	1.3
Ischemic heart disease	370	29.9	12	4,031	31.7	—	1.1
Deaf in both ears	235	21.7	13	633	13.7	—	0.6
Diabetes	884	18.9	14	3,298	31.7	—	1.7
Orthopedic impairment of upper extremity	1,356	18.1	15	1,135	21.9	—	1.2
Absence of leg(s)	59 *	71.2 *	—	148	73.5	3	1.0
Lung or bronchial cancer	15 *	73.1 *	—	84	72.7	4	1.0
Pneumoconiosis/asbestosis	82	0.0	—	169	53.3	6	na
Other heart disease/disorders†	850	16.5	—	1,951	50.1	8	3.0
Cancer of genitourinary sites	109	7.1 *	—	125	48.8	9	6.9
Cancer of digestive sites	6 *	49.0 *	—	136	46.7	10	1.0

* Figure has low statistical reliability or precision (relative standard error exceeds 30 percent).

† Heart failure, valve disorders, congenital disorders, all other and ill-defined heart conditions.

Source: National Health Interview Survey, 1983-1986. Data are estimates (annual averages) based on household interviews of the civilian noninstitutionalized population.

Note: ICD and impairment codes are provided in Appendix B.

45-69. Cancer emerges with significant risks of work limitation at ages 45-69. Cancer of the lung or bronchus, genitourinary sites, or digestive sites rank fourth, ninth, and tenth in risk of causing work limitation. Lung cancer and cancer of digestive sites are very low in prevalence at ages 18-44 and their disability risks are not statistically reliable. The risk of genitourinary cancer causing work limitation is 6.9 times higher at ages 45-69 than at ages 18-44. Pneumoconiosis and cancer are conditions characterized by long latency. Risks of other heart disease causing work limitation increase much more with age than ischemic heart disease (age ratios are 3.0 and 1.1), which is displaced from the fifteen highest risk conditions at ages 45-69. Although the risk of ischemic heart disease causing work limitation does not increase, the baseline prevalence increases eleven-fold. Other heart disease and diabetes increase substantially in prevalence as well as risk, and thus, have a large effect on the prevalence of disabling conditions at the older working ages. Multiple sclerosis increases 40 percent in risk of work limitation, but only moves up to fifth since it is displaced by absence of leg(s) and lung cancer.

Some conditions with high risks of causing work limitation at all ages drop in rank at the older working ages. Absence of arm(s) or hand(s) is not sufficiently prevalent when broken down by age to estimate risk reliably, although this condition ranked eighth for ages 18-69 combined. At ages 45-69, cerebral palsy has very low prevalence, which suggests a low rate of survival and precludes reliable estimation of disability risk. Paralysis in an extremity, either complete or partial, and deafness in both ears, are conditions for which the risk of causing work limitation drops at ages 45-69. The prevalence of these conditions increases with age and suggests that newly incident cases of these conditions are less disabling at the older ages. Work limitation risks for intervertebral disk disorders, ischemic heart disease, diabetes, and other orthopedic impairments increase with age, but not at the same pace as for other chronic conditions, and their risks drop relatively at ages 45-69.

A similar profile by age is seen for risks of chronic conditions causing inability to work (Table F). Diseases are especially prominent in risk of causing inability to work at the older working ages. Blindness has the highest risk of causing inability to work at ages 18-44. Although the risk of disability for blindness increases by 40 percent at ages 45-69, it is displaced by lung cancer, the top-ranked condition. Mental retardation has the second highest risk of causing inability to work in both age groups. Of the fifteen conditions with the highest risks of causing inability to work, at ages 45-69, ten are diseases whereas only five are diseases at ages 18-44. Compared to conditions with high risks of work limitation, emphysema and cerebrovascular disease emerge with relatively high risks of causing inability to work.

The risks of diseases causing need for assistance in basic life activities also become more prominent at older ages compared to impairments, but not quite to the same degree as they do for inability to work. Of the fifteen conditions with the highest risks of causing need for assistance in basic life activities, eight are diseases. Mental retardation ranks first in

Table F. Conditions with Highest Risk of Causing Inability to Work and Rank Order, by Age: United States, 1983-1986

Chronic Condition	Ages 18-44			Ages 45-69			
	Number of Conditions (1,000s)	Percent Causing Inability to Work	Rank	Number of Conditions (1,000s)	Percent Causing Inability to Work	Rank	Age Ratio
Blind in both eyes	76	48.6	1	105	65.9	4	1.4
Mental retardation	393	48.0	2	127	69.0	2	1.4
Cerebral palsy	134	46.3	3	23 *	49.2 *	—	1.1
Multiple sclerosis	72	39.8 *	4	82	48.8	7	1.2
Complete paralysis in extremity	133	38.2	5	288	40.6	10	1.1
Partial paralysis in extremity	94	37.0 *	6	242	50.3	6	1.4
Epilepsy	535	25.5	7	227	42.8	9	1.7
Other orthopedic impairments	133	19.1 *	8	114	28.3 *	—	1.5
Paralysis in other sites (complete/partial)	64	16.4 *	9	132	27.8 *	—	1.7
Rheumatoid arthritis	252	15.1 *	10	716	30.5	14	2.0
Ischemic heart disease	370	15.0	11	4,031	21.4	—	1.4
Deaf in both ears	235	13.2 *	12	633	6.4 *	—	0.5
Emphysema	116	11.6 *	13	1,283	29.6	15	2.6
Intervertebral disk disorders	1,659	11.6	14	1,957	25.4	—	2.2
Other absence	301	11.0 *	15	428	12.7	—	1.2
Lung or bronchial cancer	15 *	73.1 *	—	84	69.4	1	0.9
Absence of leg(s)	59 *	23.7 *	—	148	67.3	3	2.8
Pneumoconiosis/asbestosis	82	0.0	—	169	51.5	5	na
Cancer of genitourinary sites	109	7.1 *	—	125	46.8	8	6.6
Cancer of digestive sites	6 *	49.0 *	—	136	39.2	11	0.8
Other heart disease/disorders†	850	8.3	—	1,951	38.3	12	4.6
Cerebrovascular disease	173	10.7 *	—	1,161	30.8	13	2.9

* Figure has low statistical reliability or precision (relative standard error exceeds 30 percent).

† Heart failure, valve disorders, congenital disorders, all other and ill-defined heart conditions.

Source: National Health Interview Survey, 1983-1986. Data are estimates (annual averages) based on household interviews of the civilian noninstitutionalized population.

Note: ICD and impairment codes are provided in Appendix B.

Table G. Conditions with Highest Risk of Causing Need for Assistance in Basic Life Activities and Rank Order, by Age: United States, 1983-86

Chronic Condition	Ages 18-44 Number of Conditions (1,000s)	Ages 18-44 Percent Causing Need for Help in Basic Life Activities	Ages 18-44 Rank	Ages 45-69 Number of Conditions (1,000s)	Ages 45-69 Percent Causing Need for Help in Basic Life Activities	Ages 45-69 Rank	Age Ratio
Mental retardation	393	37.9	1	127	36.1	3	1.0
Complete paralysis in extremity	133	35.6	2	288	15.6 *	8	0.4
Cerebral palsy	134	29.8 *	3	23 *	17.2 *	—	0.6
Multiple sclerosis	72	28.8 *	4	82	45.1	1	1.6
Paralysis in other sites (complete/partial)	64	15.9 *	5	132	6.5 *	14	0.4
Blind in both eyes	76	8.8 *	6	105	39.7	2	4.5
Partial paralysis in extremity	94	7.4 *	7	242	28.0	5	3.8
Emphysema	116	5.9 *	8	1,283	7.1	13	1.2
Epilepsy	535	5.5 *	9	227	9.3 *	12	1.7
Cerebrovascular disease	173	4.2 *	10	1,161	15.6	9	3.7
Ischemic heart disease	370	4.1 *	11	4,031	3.5	—	0.9
Intervertebral disk disorders	1,659	3.9	12	1,957	5.1	—	1.3
Cancer of genitourinary sites	109	3.5 *	13	125	0.0	—	0.0
Other absence	301	3.4 *	14	428	2.4 *	—	0.7
Deaf in both ears	235	3.1 *	15	633	1.2 *	—	0.4
Absence of leg(s)	59 *	24.7 *	—	148	35.8	4	1.4
Other orthopedic impairments	133	0.0	—	114	17.2 *	6	na
Lung or bronchial cancer	15 *	20.3 *	—	84	17.1 *	7	0.8
Rheumatoid arthritis	252	1.5 *	—	716	12.6	10	8.4
Cancer of digestive sites	6 *	0.0	—	136	11.6 *	11	na
Other heart disease/disorders†	850	1.6 *	—	1,951	6.3	15	3.9

* Figure has low statistical reliability or precision (relative standard error exceeds 30 percent).

† Heart failure, valve disorders, congenital disorders, all other and ill-defined heart conditions.

Source: National Health Interview Survey, 1983-1986. Data are estimates (annual averages) based on household interviews of the civilian noninstitutionalized population.

Note: ICD and impairment codes are provided in Appendix B.

risk of causing need for assistance in basic life activities at ages 18-44 whereas multiple sclerosis ranks first at ages 45-69 (Table G). Many conditions have very low risks of causing need for assistance in basic life activities at ages 18-44 and have low statistical reliability. Four diseases (lung cancer, digestive cancer, rheumatoid arthritis and other heart disease) have high risks of causing need for assistance in basic life activities at ages 45-69, displacing several conditions with relatively high risks at ages 18-44.

Disability risks of chronic conditions in the working ages are presented for men in Table 3 and for women in Table 4. In the working ages, women report 38 percent more conditions than men. However, men report 27 percent more impairments than women. In general, chronic conditions among men have 32 percent higher risk of causing limitation in work than those among women (10.0% versus 7.6%, t=9.5, p<.001) and are somewhat more likely to cause inability to work (6.0% versus 5.0%, t=4.9, p<.001). However, conditions among women are 20 percent more likely than those among men to cause need for assistance in basic life activities (1.4% versus 1.2%, t=2.1, p<.05).

Paralysis in sites other than an extremity, other heart disease, cerebrovascular disease, and other respiratory conditions have risks of work limitation significantly higher among men (range of differences in percentages is 5.6 to 43.2, t-values 2.4 to 3.6, p<.05 to p<.001). Orthopedic impairment in an upper extremity, other visual impairments/retinal disorders, and hypertension have risks of work limitation significantly higher among women (range of differences in percentages is 2.9 to 8.7, t-values 2.2 to 3.1, p<.05 to p<.01). Other respiratory conditions are the only conditions with significantly higher risk of causing inability to work among men (7.0% versus 2.1%, t=3.4, p<.001), but orthopedic impairment in an upper extremity, other visual impairments /retinal disorders, and hypertension have risks of causing inability to work significantly higher among women (range of differences in percentages is 2.9 to 6.4, t-values 2.2 to 3.7, p<.05 to p<.001). Gender differences in work disability go in both directions.

Intervertebral disk disorders, orthopedic impairment in a lower extremity, ischemic heart disease, hypertension, diabetes, and epilepsy have significantly higher risks of causing need for assistance in basic life activities among women (range of differences in percentages is 0.7 to 11.9, t-values 2.0 to 2.9, p<.05 to p<.01) and risks are lower for males for most conditions. No condition has significantly higher risk of causing need for assistance in basic life activities among men than women.

Gender differences at ages 45-69 are similar to those for ages 18-69. Though some significant gender differences in risks of specific conditions causing work limitation at ages 45-69 are found, risks in general are quite similar by gender. Most conditions have somewhat lower risks of causing need for assistance in basic life activities among men than women, and four are significantly lower (intervertebral disk disorders, bursitis, ischemic heart disease, hypertension, (range of

differences in percentages is 0.9 to 5.5, t-values 2.1 to 2.7, $p<.05$ to $p<.01$). At ages 45-69, no condition has significantly higher risk of causing need for assistance in basic life activities among men than women.

In the working ages, although women report more conditions than men, risks of conditions causing work disability are similar by gender, but risks of causing need for help in basic life activities are generally somewhat higher for women.

Disability Risks in Late Life

Overall, 16.6 percent of chronic conditions among persons aged 65 and over cause some activity limitation, while 6.9 percent cause need for assistance in basic life activities (IADL and ADL) and 2.7 percent in ADL only (Table 5). When conditions do cause activity limitation, they are somewhat more likely to cause need for assistance in basic life activities in the elderly population than they are in the nonelderly population. Of chronic conditions that cause activity limitation, for all ages combined, about 22 percent cause assistance to be needed in basic life activities, whereas the figure is 42 percent for persons aged 65 and over.

In terms of major condition groups, circulatory conditions have the highest risk of causing activity limitation among elderly persons, as they do for risks of causing work disability in the older working ages. They are followed by skin and musculoskeletal conditions, miscellaneous conditions, impairments, respiratory conditions, and digestive conditions. Circulatory conditions are also highest in risk of causing need for assistance in basic life activities, but impairments are a very close second, followed by miscellaneous, skin and musculoskeletal, respiratory, and digestive conditions.

Conditions with the highest risk of causing activity limitation among the elderly population are shown in Table H. Mental retardation, multiple sclerosis, absence of arm(s) or hand(s), and cerebral palsy, all conditions with high risk of causing disability in the nonelderly population, are reported so infrequently in the elderly population that the baseline prevalence is too low to estimate risk reliably. Most of the chronic conditions with highest risks of causing activity limitation or assistance needs in basic life activities in the elderly population are those that appear on the list of conditions with high risks of causing disability at all ages, but their relative risks change, and some additional conditions emerge.

With respect to specific chronic conditions, chronic diseases rank prominently with impairments in risk of disability among the elderly. Of the fifteen conditions with highest risk of activity limitation, seven are diseases. With respect to need for assistance in basic life activities, eight are diseases. Absence of one or both legs ranks highest in risk of causing activity limitation and in risk of causing need for assistance in basic life activities. Compared to conditions with high risks of causing disability at all ages, rheumatoid arthritis moves up considerably in relative risk among the elderly, from tenth to third in terms of risk of activity limitation and from eleventh to seventh in terms of need for assistance in basic life activities. Other heart disease also moves up in rank from thirteenth to seventh in terms of risk of causing activity limitation and from fourteenth to tenth in terms of causing need for assistance in basic life activities. Cancer of genitourinary sites (mainly prostate cancer in males), orthopedic impairments in a lower extremity, epilepsy, and diabetes emerge as conditions with relatively high risks of causing need for assistance in basic life activities among elderly persons. Risks of chronic conditions causing need for assistance in activities of daily living are not

Table H. Conditions with Highest Risk of Disability and Rank Order, by Type of Disability, Ages 65 and Older: United States, 1983-1986

Chronic Condition	*Number of Conditions (1,000s)*	*Percent Causing Activity Limitation*	*Rank*	*Percent Causing Need for Help in Basic Life Activities*	*Rank*
Absence of leg(s)	123	85.6	1	58.6	1
Lung or bronchial cancer	115	73.9	2	44.9	3
Rheumatoid arthritis	368	63.6	3	30.4	7
Blind in both eyes	207	63.5	4	54.1	2
Partial paralysis in extremity	289	63.0	5	40.2	4
Other orthopedic impairments	66	63.0	6	33.5 *	5
Other heart disease/disorder†	2,203	54.5	7	24.0	10
Paralysis in other sites (complete/partial)	82	52.3	8	26.1 *	9
Pneumoconiosis or asbestosis	175	51.5	9	6.3 *	—
Complete paralysis in extremity	235	47.5	10	31.7	6
Cancer of genitourinary sites	93	45.3	11	23.4 *	11
Emphysema	1,116	45.1	12	12.4	—
Intervertebral disk disorders	669	41.1	13	9.6	—
Diabetes	2,572	38.0	14	17.5	14
Cerebrovascular disease	1,631	37.6	15	28.5	8
Cancer of digestive sites	124	36.6	—	22.5 *	12
Orthopedic impairment in lower extremity	2,135	35.7	—	18.2	13
Epilepsy	104	32.2 *	—	16.0 *	15

* Figure has low statistical reliability or precision (relative standard error exceeds 30 percent).

† Heart failure (16%), valve disorders (11%), congenital disorders (5%), all other and ill-defined heart conditions (68%)

Source: National Health Interview Survey, 1983-1986. Data are estimates (annual averages) based on household interviews of the civilian noninstitutionalized population

Note: ICD and impairment codes are provided in Appendix B.

ranked because the estimates have low statistical reliability. However, paralysis of any kind, blindness, lung cancer, genitourinary cancer, and cerebrovascular disease have the highest risks of causing need for assistance in activities of daily living (Table 5).

The need for assistance in basic life activities is the only measure of disability based on a uniform set of activities for all adult ages. Thus, risks of conditions causing such need can be compared by age for young adults and elderly persons. The term *age ratio* is defined here as the ratio of the risk a condition causes need for assistance in basic life activities at ages 65 and over relative to its risk at ages 18-44. In terms of major condition groups, respiratory conditions have the largest age ratio, followed by digestive, circulatory, miscellaneous, and skin and musculoskeletal conditions, and impairments. These results are very similar to those found for age increases in risks of conditions causing disability among the working age population. Mental retardation, cerebral palsy, and multiple sclerosis are conditions prevalent at ages 18-44 that have relatively high risks but disappear in prevalence at ages 65 and over.

Of conditions that are prevalent throughout the lifespan, some change little in risk, while others become more innocuous or more pernicious with age. Considering conditions that are prevalent with some statistical reliability at both age groups and that rank in the top fifteen in risk of causing need for assistance in basic life activities, those with the highest age ratios in risk include orthopedic impairment in a lower extremity (22.8), followed by rheumatoid arthritis (20.3), other heart disease (15.0), diabetes (9.7), cerebrovascular disease (6.8), cancer of genitourinary sites (6.7), blindness in both eyes (6.1), and partial paralysis in an extremity (5.4). It is clear that risks of conditions causing need for assistance in basic life activities increase substantially over the lifespan. Although conditions with the highest rates of increase include diseases and impairments, the latter have considerable disease involvement at the older ages.[9] Other orthopedic impairments have zero risk at ages 18-44, but rank fifth at ages 65 and over. Ischemic heart disease, and other absence have risks essentially the same at both age groups, while deafness declines in risk.

Elderly women report 69 percent more chronic conditions than elderly men. Unlike in the working ages, elderly women report more impairments than men. Part, but not all, of the gender difference in prevalence is due to elderly women outnumbering elderly men by roughly 42 percent, based on NHIS data for 1987 (Schoenborn and Marano, 1988). Overall, the risk of conditions causing activity limitation is the same for elderly men and women (16.4% versus 17.0%, t=1.1). Osteoarthritis, osteomyelitis/bone disorders, impairments in an upper extremity, diabetes, and anemias are significantly less likely to cause activity limitation among men than women (range of differences in percentages is 5.6 to 18.7, range of t-values is 2.1 to 3.0, $p<.05$ to $p<.01$). Blindness is significantly more likely to cause activity limitation among elderly men (78.8 versus 45.7, t=2.2, $p<.05$).

The risk of conditions causing need for help in basic life activities is significantly lower among elderly men than women (5.6% versus 7.8%, t=6.0, $p<.001$). Ten conditions have risks of causing need for assistance in basic life activities that are significantly lower among elderly men than elderly women (range of differences in percentages is 2.2 to 34.7, range of t-values is 2.0 to 4.0, $p<.05$ to $p<.001$). No condition has significantly higher risk of causing need for assistance in basic life activities among men. Conditions among elderly males are generally less likely to cause need for help in basic life activities compared to those among elderly females. Gender differences in risks of conditions causing need for help in basic life activities among the elderly may be sensitive to age differences, but conditions among males also have lower risks than females in the working-aged population. Thus, conditions have lower risks of causing need for help in basic life activities among males, independent of age.

Multivariate Analysis

Above, risks of chronic conditions causing disability were based on crude estimates. However, such crude estimates subsume differences in the characteristics of populations with specific conditions. Populations with specific conditions vary by age, gender, race, ethnicity, educational attainment, social support, duration of the condition, and other factors that are associated with disability risk. The purpose of this section is to provide estimates of risks of chronic conditions causing disability adjusted for population characteristics and to compare them with crude estimates of risks.

Adjustment for compositional factors is a problem commonly encountered in epidemiologic analysis and has its classic resolution by the method of *direct standardization*. In this approach, risks are estimated for various categories of compositional variables and weighted according to a standard population distribution to obtain a summary adjusted risk value. Direct standardization is a method, in effect, that renders the populations similar with respect to factors that affect an outcome variable of interest.

When populations differ with respect to many variables that affect an outcome variable, direct standardization is not feasible and multivariate adjustment is preferred. Because the outcome variables in the present study are binary (whether a condition causes a particular disability or not), have low mean values (under 20 percent), and certain compositional variables (age and education) are measured continuously, the method of logistic regression is appropriate (Hanushek and Jackson, 1977).[10] With logistic regression, the effects of several variables can be adjusted simultaneously using a functional form appropriate for measuring variation among chronic conditions in disability risks. The model employed is

$$D = \frac{1}{1+e^{-x_t b_t}}, \qquad (2)$$

where D is an indicator variable of whether or not a condition causes disability, x_t is a vector of t condition and compositional variables, and b_t represents the estimated effects (nonstandardized regression parameters) of each variable on

[9] Analysis of NHIS impairment etiology codes indicates that the involvement of stroke, neoplasms, diabetes, and eye diseases increase throughout the lifespan, from 7.1% among children under age 18 to 16.4% at ages 85 and older. A variety of other diseases such as arthritis are involved in the etiology of some impairments, but are not identified separately in the NHIS.

[10] Models were estimated using PROC LOGIST in SAS with standard defaults.

the risk of disability, controlling for the effects of all other variables. Parameters of the model were estimated by maximum likelihood, which is an iterative method of model estimation.

Adjustment of all of the 62 conditions for which estimates of risk are provided in Tables 1 through 5 would be intractable both in estimation and presentation. Instead, each of the fifteen conditions with highest crude risk is examined relative to all other conditions combined. Indicator variables (1 if condition is present in a particular case, 0 otherwise) were created for each of the fifteen conditions with highest crude risk and are included in a logistic regression model. The intercept term measures the risk of disability for all conditions other than the fifteen conditions defined by the indicator variables. Compositional variables include indicator variables for gender, race, ethnicity, and marital status, and continuous variables for age and years of education attained. These factors have been widely demonstrated to influence disability prevalence rates (Haber, 1971; Nagi, 1976). Because disability assessment may differ between self and proxy respondents, an additional indicator variable was introduced to compare persons who respond for themselves with persons for whom others respond. Proxy responses are mandatory for children under age 19, except if married. Any adult may respond for other related household members who are not at home or for persons at home who are unable to respond for themselves at the time of the visit (NCHS, 1987b). Since disability risks in general increase with time after the onset of a condition, additional indicator variables were introduced to control for differences in duration among conditions.

It is assumed that observations are drawn from a simple random sample. This assumption is not fully met by the NHIS, in which a stratified cluster sample design is used. The impact is that estimated standard errors are usually lower than they would be if the sample design were taken into account. This problem does not affect the estimated model parameters b_t. Analyses of complex data in which the sample design is taken into account show that the true standard error is most often in the range of 1.3 to 2.0 times higher than standard errors based on an assumption of simple random sampling (see, for example, Lepkowski, Landis, Parsons, & Stehouwer, 1988). However, when estimated effects are highly significant, the impact of the sample design is negligible. A constraint in this analysis is that the sample design of the NHIS changed in 1985 and standard errors incorporating the sample design cannot be estimated for all four years of data combined. Therefore, regression analysis is performed assuming the sample is randomly selected. Significance of estimates that are moderately significant ($p<.05$ to $p<.01$) may be affected by the sample design.

The condition indicator variables measure the risk of disability for each of the fifteen high-risk conditions relative to all other conditions independent of all compositional variables. The unit of analysis is actually the condition and whether or not it causes disability; the characteristics of the person are contextual. Models were estimated separately for risk of any activity limitation (all ages), inability to work (ages 18-69), and need for assistance in basic life activities (ages 5 and over).

Results from a logistic regression analysis of the risks of activity limitation for specific chronic conditions are presented in Table I for all ages combined. After an initial model was estimated, terms that were not significant at the $p<.05$ level were eliminated, and only the final model is presented. Considering the compositional variables first, the effect of age is nonlinear, as shown by the significant parameters for age and age squared. Risk of activity limitation increases quickly with age through midlife, then tends to flatten at the oldest ages. Educational attainment also exhibits a nonlinear effect, but the greatest reduction in risk of activity limitation is at the highest years of education. Education of the family head was substituted for children under age 18, assuming an effect of parents' educational attainment on children's health. For indicator variables, the comparison group is indicated within braces {}. Chronic conditions have lower risks of activity limitation among women than among men, as was shown above with crude estimates. Chronic conditions among whites have the lowest risk of activity limitation and those among Hispanics have significantly lower risks of activity limitation than those among other racial and ethnic groups. As determined by an initial model, chronic conditions among Asian and Pacific Islanders are not significantly different in risk from those among blacks. Chronic conditions among married persons have lower risks of activity limitation than those among nonmarriedpersons. Risk of activity limitation increases with the duration a person has had a condition, independent of age. No significant difference is found between self-respondents and persons for whom others respond.

Condition variables and their estimated model parameters are listed by rank order of crude risks of activity limitation as shown in Table B. The adjusted risk for each condition is determined from the model holding all compositional variables at their mean levels (shown in the last column of Table I). As shown in Table I, the adjusted risk differs from the crude risk for several conditions. Changes range from a decline of 10.7 percentage points for emphysema to an increase of 4.4 percentage points for cerebral palsy. The conditions for which risk increases have lower mean age than conditions for which risk decreases. That age adjustment has a large influence on risk is expected, but conditions vary on many of the factors controlled in the model, and the net effect of adjustment cannot be attributed to a single factor. Changes due to adjustment are large enough that they affect the rank ordering of conditions. For example, cerebral palsy rises from fifth to third in risk of activity limitation while lung cancer goes from third to fifth.

Furthermore, changes occur in the level of risk of the top fifteen conditions relative to all other conditions. This is seen by comparing the odds ratio estimated from the model to that calculated from crude estimates of risk. The ratio of the probability that a condition causes disability to the probability it does not cause disability is termed the *odds* that a condition causes disability.[11] The *odds ratio*, frequently used in epidemiological studies as an indicator of relative risk, in this instance measures the odds that a specific condition causes an activity limitation relative to the odds for all conditions other than the top fifteen identified in the model. Table I shows that the adjusted odds ratio is much higher than the crude odds ratio for mental retardation. This results because, for mental retardation, the crude risk of activity limitation is somewhat less than the adjusted risk, while for all conditions other than the top fifteen, the crude risk is somewhat higher than the adjusted risk. Cerebral palsy and multiple sclerosis also have higher adjusted than crude odds ratios. Thus, relative risks for

[11] Namely, $p/(1-p)$, where p is the risk of disability.

Table I. Logistic Regression Model of Risk of Chronic Conditions Causing Activity Limitation, Adjusted Risk, and Comparison to Crude Risk, All Ages

Variable	b	Std. Error	Chi-Square	P	Adjusted * Risk (%)	Rank	Adjusted† Odds Ratio	Crude Risk (%)	Crude§ Odds Ratio	Variable Means
Intercept	-2.48832	0.08266	906.1	<.001	8.9			9.9		
Condition variables										
Mental retardation	4.13115	0.16221	648.6	<.001	85.9	1	62.2	84.1	48.1	0.0031
Absence of leg(s)	3.68962	0.31537	136.9	<.001	79.7	2	40.0	83.3	45.4	0.0007
Lung or bronchial cancer	3.21541	0.32573	97.5	<.001	70.9	5	24.9	74.8	27.0	0.0005
Multiple sclerosis	3.35908	0.33557	100.2	<.001	73.8	4	28.8	70.6	21.9	0.0004
Cerebral palsy	3.37588	0.26743	159.4	<.001	74.1	3	29.3	69.7	20.9	0.0007
Blind in both eyes	2.65706	0.21784	148.8	<.001	58.2	6	14.3	64.5	16.5	0.0010
Partial paralysis in extremity	2.44891	0.17216	202.3	<.001	53.1	8	11.6	59.6	13.4	0.0015
Other orthopedic impairments	2.64731	0.23399	128.0	<.001	58.0	7	14.1	58.7	12.9	0.0008
Complete paralysis in extremity	2.15131	0.16478	170.5	<.001	45.7	11	8.6	52.7	10.1	0.0016
Rheumatoid arthritis	2.21822	0.11603	365.5	<.001	47.4	10	9.2	51.0	9.5	0.0031
Intervertebral disk disorders	2.23106	0.06530	1167.2	<.001	47.7	9	9.3	48.7	8.6	0.0101
Paralysis in other sites	2.03350	0.25921	61.5	<.001	42.8	12	7.6	47.8	8.3	0.0006
Other heart disease/disorders**	1.89713	0.06084	972.2	<.001	39.5	13	6.7	46.9	8.0	0.0120
Cancer of digestive sites	1.86697	0.26633	49.1	<.001	38.8	14	6.5	45.3	7.5	0.0006
Emphysema	1.61209	0.08991	321.5	<.001	32.9	15	5.0	43.6	7.0	0.0053
Compositional variables										
Age in years	0.02916	0.00258	128.0	<.001			1.0			47.9006
Age in years squared	-0.00014	0.00003	29.1	<.001			1.0			2756.7200
Female (male)	-0.17405	0.02168	64.4	<.001			0.8			0.5842
White (non-white, non-Hispanic, unknown)	-0.37726	0.02948	163.8	<.001			0.7			0.8368
Hispanic (non-white, non-Hispanic, unknown)	-0.15463	0.05643	7.5	.006			0.9			0.0400
Education in years	-0.02618	0.00986	7.1	.008			1.0			11.6619
Education in years squared	-0.00245	0.00050	24.1	<.001			1.0			148.3690
Married..(not married)	-0.23189	0.02346	97.7	<.001			0.8			0.5769
Onset 1 to 5 years ago (onset < 1 year)	0.39856	0.03796	110.2	<.001			1.5			0.2788
Onset >5 years ago (onset < 1 year)	0.44804	0.03533	160.9	<.001			1.6			0.5722
Model Chi-Square = 7780.5 with 25 d.f. p<.001		R=0.324	C=0.711		N=101,703 observations					

* All compositional variables held at mean levels.

† Equals exp (b).

§ Equals [p/(1-p)]/[p'/(1-p')] where p is the crude risk for a condition and p' is the crude risk for all except 15 highest risk conditions.

** Heart failure, valve disorders, congenital disorders, all other and ill-defined heart conditions.

these conditions are underestimated by crude risk data. However, for other conditions, adjusted relative risks are similar to crude relative risks. Thus, adjustment for population characteristics has a small effect on estimates of risk of activity limitation for the highest crude risk conditions relative to all conditions.

Age and education have effects approaching those of the highest risk conditions. For example, the adjusted odds ratio for a condition in a person 80 years of age (compared to an infant) is 4.2. A condition in a person with 8 years of education has an odds ratio of causing activity limitation 2.4 times as high as a condition in someone with 18 years of education (the latter is the limit of years of education recorded in the NHIS). Compared to the high-risk conditions, the effects of the compositional variables other than age and education are small. However, the effects of the compositional variables are additive, and several characteristics (i.e., non-married black males) can have a large effect on the risk of activity limitation.

A separate logistic regression analysis was undertaken to estimate risks of specific chronic conditions causing inability to work among persons aged 18-69. Results are shown in Table J. Considering first the compositional variables, the effect of age is linear (age in years squared was not significant), but the effect of education is not. The risk of inability to work declines faster as education level increases. Age and education have highly significant effects. As was shown with crude estimates, conditions have somewhat lower risk of causing inability to work among women than among men. Conditions also have lower risks of causing inability to work among whites, Native Americans, and Hispanics than among other racial and ethnic groups. Conditions among married persons have lower risk of inability to work than among unmarried persons. Risk of inability to work increases with the duration of a condition independent of the person's age.

The risk of a condition causing inability to work is significantly higher for persons who respond for themselves than for persons for whom others respond. At first glance, this result might seem to indicate differences in self versus proxy assessment of ability to work. But it may indicate that persons who are not available to respond for themselves are more likely to be working. Degree of impairment in physical functioning and other factors could not be controlled in the model and prevents interpreting this result as a difference in assessment.

As with activity limitation, some change occurs in the ranking of risks when adjustment is made for population composition. For two conditions, the adjusted risks are greater than the crude risks: multiple sclerosis, which moves up from seventh to third in rank, and cerebral palsy, which moves from fifth to fourth. All the other top fifteen conditions have lower adjusted than crude risks. The largest reductions are observed

for cancer of digestive sites, pneumoconiosis, other heart disease, cerebrovascular disease, and emphysema. In addition, the risk for all conditions other than the fifteen included in the model declines from 4.5 to 2.9 percent after adjustment. The odds ratios for cerebral palsy, multiple sclerosis, and blindness are considerably higher based on the logistic model than when based on crude data, signifying that crude estimates understate their risks relative to other conditions. The odds ratios for cancer of digestive sites, pneumoconiosis, other heart diseases, cerebrovascular disease, and emphysema decline. It appears this result is due to the concentration of these conditions at the older working ages.

Adjustment for population composition has more of an impact on inability to work than on activity limitation. The greater prominence of diseases with high risk of causing inability to work, especially at the older working ages, seems the most likely reason. As for the previous model of risk of activity limitation at all ages, age and education have strong effects while the effects of other variables are smaller.

Several models of the risks of chronic conditions causing need for assistance in basic life activities were estimated but did not converge. The failure of the models to converge is most likely due to the limited dispersion of the condition variables which renders a solution difficult (Freeman, 1987). The above results suggest that adjustment would have some impact on risks of conditions causing need for assistance in basic life activities. Alternative qualitative methods requiring categorization of age and education should be explored.

As mentioned above, standardization is a method of adjustment for compositional variables. Standardization is appropriate when the adjustment result does not depend on the choice of a standard distribution (Little & Pullum, 1979). The adjusted risk estimates presented in this analysis would be independent of choice of population distribution if there were no interactions between the condition indicator variables and the compositional variables in their effect on disability risk. If interaction effects are not present in these data, the adjusted risk of disability for specified conditions would be equivalent to the directly standardized risk based on a completely stratified table (Wilcosky & Chambless, 1985).

Consideration was given to estimating interaction effects. However, certain high-risk conditions are so low in prevalence that their interaction with other variables cannot be estimated reliably. An exploration of interactions between conditions and age in a model of inability to work was carried out using ordinary least squares regression. Loss of significance for both main and interactive effects for several low prevalence conditions resulted, which can be attributed to high collinearity between the indicator and indicator-age interaction variables. For some conditions, significant interaction effects with age

Table J. Logistic Regression Model of Risk of Chronic Conditions Causing Inability to Work, Adjusted Risk, and Comparison to Crude Risk, Ages 18-69

Variable	b	Std. Error	Chi-Square	P	Adjusted * Risk (%)	Rank	Adjusted† Odds Ratio	Crude Risk (%)	Crude§ Odds Ratio	Variable Means
Intercept	-4.1862	0.1149	1304.8	<.001	2.9			4.5		
Condition variables										
Lung or bronchial cancer	3.8314	0.4570	70.3	<.001	57.9	1	46.1	69.9	49.3	0.0003
Blind in both eyes	3.6627	0.3385	117.1	<.001	53.7	2	39.0	58.6	30.0	0.0006
Absence of leg(s)	3.2049	0.3082	108.1	<.001	42.3	5	24.7	54.9	25.8	0.0007
Mental retardation	3.0471	0.1938	247.2	<.001	38.5	6	21.1	53.1	24.0	0.0018
Cerebral palsy	3.4356	0.3404	101.9	<.001	48.1	4	31.1	46.7	18.6	0.0005
Partial paralysis in extremity	2.8284	0.2400	138.9	<.001	33.5	7	16.9	46.6	18.5	0.0012
Multiple sclerosis	3.4559	0.3408	102.9	<.001	48.6	3	31.7	44.6	17.1	0.0005
Complete paralysis in extremity	2.5340	0.2165	137.0	<.001	27.3	8	12.6	39.8	14.0	0.0015
Cancer of digestive sites	2.2825	0.3513	42.2	<.001	22.6	11	9.8	39.6	13.9	0.0005
Pneumoconiosis/asbestosis	1.9773	0.2904	46.4	<.001	17.7	12	7.2	34.7	11.3	0.0009
Epilepsy	2.5256	0.1741	210.5	<.001	27.1	9	12.5	30.6	9.4	0.0027
Other heart disease/disorders **	1.8935	0.0918	425.7	<.001	16.5	13	6.6	29.2	8.8	0.0098
Cancer of genitourinary sites	2.4821	0.3176	61.1	<.001	26.3	10	12.0	28.3	8.4	0.0008
Cerebrovascular disease	1.5886	0.1295	150.5	<.001	12.7	14	4.9	28.1	8.3	0.0047
Emphysema	1.5094	0.1259	143.7	<.001	11.9	15	4.5	28.1	8.3	0.0049
Compositional variables										
Age in years	0.0462	0.0015	992.9	<.001			1.0			45.1339
Female (male)	-0.2575	0.0369	48.7	<.001			0.8			0.5798
White (black, Asian, unknown)	-0.5800	0.0456	162.0	<.001			0 6			0.8332
Native American (black, Asian, unknown)	-0.4526	0.2127	4.5	.033			0.6			0.0065
Hispanic (black, Asian, unknown)	-0.2903	0.0900	10.4	.001			0.7			0.0409
Education in years squared	-0.0073	0.0003	681.5	<.001			1.0			154.1750
Married (not married)	-0.3012	0.0379	63.2	<.001			0.7			0.6808
Self-respondent (proxy respondent)	0.3957	0.0498	63.2	<.001			1.5			0.7722
Onset 1 to 5 years ago (onset < 1 year)	0.2170	0.0651	11.1	<.001			1.2			0.2684
Onset >5 years ago (onset < 1 year)	0.3473	0.0595	34.1	<.001			1.4			0.5880
Model Chi-Square = 5368.6 with 25 d.f. p<.001		R = 0.417	C=0.804		N=73,685 observations					

* All compositional variables held at mean levels

† Equals exp (b)

§ Equals [p/(1-p)]/[p'/(1-p')] where p is the crude risk for a condition and p' is the crude risk for all except 15 highest risk conditions.

** Heart failure, valve disorders, congenital disorders, all other and ill-defined heart conditions

were observed, as would be expected based on the analysis of crude risks by age presented above. However, estimation of interaction effects for all compositional variables using logistic regression is simply not feasible with these data. Thus, the results of adjustment may depend on the method of adjustment used and is an issue that should be further explored.

Discussion

This study describes changes across the lifespan in risks of specific chronic conditions causing disability in the noninstitutional United States population. As Haber (1971) concluded, most chronic conditions have low risks of causing disability. About half of persons aged 18-64 have a chronic condition (Lando, Cutler & Gambler, 1982), while only 15 percent of the working-age population have a limitation in activity (LaPlante, 1988) and about 10 percent have a limitation in work (Bennefield & McNeil, 1989). Among elderly persons, at least 80 percent have a chronic condition (Guralnik *et al.*, 1989), while roughly 40 percent of the elderly population have some activity limitation and about 17 percent need assistance in basic life activities. It is a simple fact that most persons with chronic conditions are not limited in activity, nor do most conditions cause disability.

This study shows that the risk of a chronic condition causing activity limitation is inversely related to the prevalence of the condition. A few relatively rare conditions have very high risks of disability, while other, more common, conditions have moderate to low risks of disability. This empirical generalization describes how it is that persons with disabilities have such a variety of conditions that cause their disabilities.

Impairments generally have higher risks than diseases of causing disability at most ages. Conditions with the highest risks of causing disability are different for children and adults. Impairments (mental retardation and cerebral palsy) and diseases (epilepsy and diabetes) have the highest risks of disability among children. Severe physical impairments, such as absence of a leg, have relatively high risks of disability at all adult ages, while the relative risk for some conditions, such as rheumatoid arthritis, increases with age. While physical and mental impairments are highest in risk in the working ages, several diseases have relatively high risks of disability including lung cancer, multiple sclerosis, digestive cancer, rheumatoid arthritis, pneumoconiosis and asbestosis, genitourinary cancer, epilepsy, emphysema, and cerebrovascular disease. With the exception of multiple sclerosis, these diseases also have relatively high risk of causing disability among the elderly.

Populations with various health conditions often differ in demographic and social characteristics that affect disability risks. Adjustment is a way of comparing disability risks by standardizing these characteristics across conditions. Such adjusted risks reflect characteristics that are more intrinsic to conditions since the effects of social and demographic factors are held constant. Age, gender, educational attainment, race, ethnicity, marital status, and duration with a condition were found to significantly predict the risk of conditions causing disability. Adjustment for these factors changes the ranking of conditions with highest risks. Estimates of relative risks of conditions causing activity limitation are higher than unadjusted (crude) estimates for mental retardation, cerebral palsy, and multiple sclerosis, but adjusted and crude estimates are similar for other high-risk conditions. Estimates of relative risks of conditions causing inability to work are higher for cerebral palsy, multiple sclerosis, and blindness, and lower for cancer of digestive sites, pneumoconiosis, other heart disease, emphysema, and cerebrovascular disease. Adjustment has more of an impact on inability to work than activity limitation, which may reflect the greater prominence of diseases with high risks of causing inability to work especially at the older working ages.

That women report chronic conditions more frequently than men is well-known (Verbrugge, 1987) but continues to generate debate. One argument is that men deny symptoms until their conditions become more serious while women are presumed more aware of their health and more willing to talk about health problems before they become serious. If that assertion is true, disability risks should be higher among men than women, especially for conditions reported relatively more often by women. The present analysis shows that conditions women report result in activity limitation and in work disability equally as often as they do for men. However, risks of causing need for assistance in basic life activities are somewhat lower among men. One explanation for this result is that males may be generally more resistant to help in basic life activities compared to females. If females have more impairing conditions, that may also account for this difference. However, if the latter is true, it must be concluded that females are more able than men to adapt activity to their impairments, since risks of activity limitation of conditions among females are the same as those among males. No relationship is apparent between gender differences in disability risk and gender differences in prevalence of specific conditions. Thus, it appears that greater prevalence of conditions among women is associated with equal, not greater, risk of disability. A truer test of gender differences would hold constant the degree of impairment of functioning in physical activity and the demands of expected roles, but this is not possible with the NHIS data.

As mentioned earlier, only chronic condition categories recommended by NCHS for estimating prevalence from the NHIS were used to estimate disability risks (NCHS, 1987a). These categories are for the most part identical to the conditions specifically named on the checklists used in the NHIS. An exception in this analysis was to distinguish rheumatoid arthritis from other arthritis. This modification is based on more specific information about the name of a condition that respondents may recall from having spoken to a medical professional about it. A review of the recommended categories was undertaken to determine whether additional significant high-risk conditions could be identified in this manner. Within each recommended category, conditions were further tabulated by detailed ICD codes It was found that a few additional conditions with reliable prevalence and relatively high risks of causing disability could be identified.

For all ages combined, two conditions with low prevalence and relatively high risks of disability are hypertensive heart disease with prevalence of 175,000 and black lung disease with prevalence of 135,000. Risks of causing activity limitation, major activity limitation, and need for assistance in basic life activities for hypertensive heart disease are 76.9%, 65.2%, and 18.8%; for black lung disease, 66.1%, 51.0%, and 16.7%. Hypertensive heart disease (subsumed under hypertension) would rank third in risk of causing activity limitation and fourth in risk of causing major activity limitation, but tenth in

risk of causing need for assistance in basic life activities. Black lung disease (subsumed under pneumoconiosis/asbestosis) would rank seventh in risk of causing activity limitation and eighth in risk of causing major activity limitation, but eleventh in risk of causing need for assistance in basic life activities. Severe partial blindness (blind in one eye, visual impairment in the other) (subsumed under other visual impairment/retinal disorders) with prevalence of 199,000 has risks of causing activity limitation, major activity limitation, and need for assistance in basic life activities of 37.0%, 30.6%, and 15.3%. Severe partial blindness would not rank high in risks of activity limitation, but would rank thirteenth in risk of causing need for assistance in basic life activities. Osteoporosis (subsumed under osteomyelitis/bone disorders), with prevalence of 1.0 million, has risks of causing activity limitation, major activity limitation, and need for assistance in basic life activities of 38.4%, 29.0%, and 13.3%. Although the latter estimate is relatively high, osteoporosis would not enter into the highest ranking conditions at all ages once adjustments for the conditions mentioned above are made.[12] However, osteoporosis does have relatively high risks of causing activity limitation and causing need for assistance in basic life activities in the elderly population.

Thus, some conditions with high risks of disability are currently subsumed under other categories. The lists of conditions asked in the NHIS could also be modified by adding conditions that occur often as causes of disability, in particular the major types of mental illnesses, cognitive diseases, and HIV exposure and AIDS. The prevalence of HIV exposure and AIDS may be sufficient to estimate statistically reliably from the NHIS, and information on their risks of causing disability is lacking.

Mental disorder other than deficiency of intelligence is a significant, but often neglected, cause of disability. Based on data from the NHIS, mental disorder (which includes mental illness and cognitive impairment) is ranked eighth among conditions reported as the main cause of activity limitation (3.9 percent of all) and seventh among all conditions reported as main or secondary causes of activity limitation (3.5 percent of all) (Table A). Unfortunately, risks of disability from mental health conditions cannot be estimated from the NHIS because such conditions are only recorded when they are reported to cause a disability in an individual. The question of the relative risks of mental versus physical conditions causing disability necessitates some discussion.

Only two of the national surveys mentioned above provide published data that can be used to estimate risks of disability from mental health conditions, and the methodological problems are severe. As indicated above, from the 1972 Survey of Disabled and Nondisabled Adults, it was estimated that 629,000 working-age persons had a mental illness, 79.7 percent of whom had some work disability. About 3.8 million persons were estimated to have "chronic nervous trouble" (which includes symptoms with potential of mental illness), of whom 61.3 percent had some work disability. Of the 287,000 persons estimated to have an alcohol or drug problem, 46.6 percent had some work disability. However, these mental health conditions do not necessarily cause the work disability and the estimated risks may be substantially biased upwards if other more seriously disabling conditions are present. Some degree of bias is expected due to associations of certain physical and mental conditions. Mental health conditions, such as depression, may result from having a disabling physical condition. Mental health conditions (such as anxiety) may also precipitate serious physical conditions (such as heart conditions). Stewart and associates (1989) found several physical health conditions to be significantly associated with poorer mental health.

Although the 1978 Survey of Disability and Work provides estimates of mental disorders (8.6 million persons of which 58% have a disability), mental retardation is included and data have not been published by detailed ICD code (Lando *et al.*, 1982). Furthermore, the 1972 and 1978 surveys did not employ standardized assessment procedures and differ in the probes used for detecting chronic health conditions.[13] Ashbaugh *et al.* (1983) estimate from the 1978 survey that about 1.1 million working-aged persons have disabling mental illness, but baseline data on mental illness prevalence needed to estimate disability risk are unavailable.

We must turn to sources other than national surveys for more accurate information on disability risks of mental health conditions.

The Epidemiologic Catchment Area (ECA) study is a state-of-the-art investigation of the epidemiology of mental disorders among adults in five geographic areas. In the ECA, the NIMH Diagnostic Interview Schedule yields diagnoses of mental disorder according to DSM-III criteria. Using data on adults from the Los Angeles site for 1982-1983, Wells, Golding, and Burnam (1988) investigated associations between chronic physical conditions and mental disorder[14] and between these conditions and activity limitation. The activity limitation measure is based on an instrument similar to that used in the NHIS and their results can be compared to the results of the analysis reported herein. They found that 20.4 percent of the sample had a mental disorder lasting 6 or more months and 32.9 percent had a chronic physical condition. About 7 percent had physical and mental conditions, while 54 percent had neither.

After adjustment for differences in age and gender, 22.4 percent of adults with a mental condition and 25.1 percent of adults with chronic physical conditions had an activity limitation. Of adults with only a mental health condition, 9.8 percent had an activity limitation, whereas 21.0 percent of

[12] Spina bifida can also be separately identified with prevalence of 85,000. The risk of spina bifida causing activity limitation is 44.2%, although this often paralyzing condition would generally be expected to have higher risk. Only 27,000 (32 percent) are under age 18. Since spina bifida is developmental, a larger percentage would be expected to be children. Spina bifida is not asked specifically on the NHIS checklists, and these results suggest some age bias in the voluntary reporting of the condition.

[13] In both surveys, the probe was simply whether a person had a "mental illness" or a "nervous or emotional problem." Type of condition was not distinguished.

[14] Chronic physical conditions consisted of 15 conditions based on a battery of questions from the National Hispanic Health and Nutrition Examination Survey (NHHANES). These include emphysema, asthma, other chronic lung disease, diabetes, heart disease, hypertension, arthritis, amputation, paralysis, birth defect, deafness, blindness, cancer, stroke, and other neurological conditions. Mental disorder includes schizophrenic, affective, anxiety, substance abuse, and severe cognitive disorders (other than deficiency of intelligence) occurring within 6 months of interview.

adults with only a chronic physical condition had an activity limitation. Of adults with both physical and mental conditions, 39.7 percent had an activity limitation. Thus, the risk of activity limitation is higher for physical than mental conditions, and potentially synergistic.

The age and gender-adjusted risk of activity limitation varied by mental condition. The major affective disorders ranked highest in risk of activity limitation (31.9%), particularly major depression (38.2%). Next were dysthymia or depressive neurosis (29.4%), substance abuse (28.1%), particularly alcohol (28.6%), and, last, anxiety disorders (24.5%). Although adults with schizophrenia had a relatively high risk of activity limitation (30%), the estimate is not statistically reliable. Other studies suggest that over 50 percent of working-age adults with schizophrenia have a work limitation (Mohs and Lesser, 1987). Adults with antisocial personality or cognitive dysfunction were no more likely than adults without mental health conditions to be limited in activity, but the number of cases was very small.

The above estimates were not adjusted for the co-occurring chronic physical conditions. In a logistic regression model controlling for demographic characteristics (i.e., age, gender, ethnicity, job status, education, and marital status), mental and physical conditions were significantly and independently associated with activity limitation. These results provide estimates of disability risk through indirect attribution of cause. As would be expected from the unadjusted data, the risk of activity limitation was smaller for mental than for physical health conditions. Furthermore, of affective disorders, anxiety, substance abuse, and all other mental health conditions, only adults with anxiety and affective disorders had significantly higher risks of activity limitation than adults with no conditions, controlling for the presence of any physical condition. The effects of physical and mental conditions were found to be additive, not synergistic. Unfortunately, Wells and associates did not provide regression estimates. Therefore, all we know is that adults with anxiety and affective disorders have a significantly higher risk of activity limitation than adults with no conditions, independent of their physical conditions, but we do not know how much lower risks of activity limitation are for mental illness conditions than for physical conditions. No comparisons of risk were made between specific mental conditions and specific physical conditions.

A question arises as to the generalizability of the population on which the above study was based. Staged probability samples were drawn from two catchment areas. The resulting sample is disproportionately Mexican-American (50 percent). Furthermore, whites were drawn from the Venice/Culver City area and are probably higher than average social class. Based on NHIS data, 17.4 percent of the U.S. population 18 years and older have an activity limitation (LaPlante, 1988). NHIS data also show that adult Hispanics have slightly lower rates of activity limitation than non-Hispanics. Approximately 11.7 percent of the Los Angeles sample had an activity limitation, a lower estimate compared to the NHIS. It appears that risk of activity limitation is underestimated in the Los Angeles sample compared to the general U.S. population, but this may result from sampling error. The racial composition of the Los Angeles ECA sample remains a potential source of bias since the present analysis of NHIS data shows significant differences by race and ethnicity in risks of disability for physical conditions.

Estimates of risks of mental illness conditions causing activity limitation from the ECA study can be compared to the estimates of risks of physical health conditions from the analysis of the NHIS data presented herein. Estimates of risk of conditions causing activity limitation from the NHIS are not presented herein for adults. However, conditions among children make up only 9.0 percent of conditions reported at all ages, so results for all ages will be compared to those for adults from the ECA study. It is clear that even major depression, the condition with the highest risk of mental disorders in the ECA, would not rank among the fifteen conditions with the highest risks of activity limitation at all ages, although it comes close. Thus, it may be concluded that the risks of mental disorders causing activity limitation are low to moderate compared to physical health conditions.

Another study provides comparisons of depression with specific health conditions. With the exception of schizophrenia, depression appears to be the most disabling of the mental illnesses. Wells and associates (1989) examined associations of depressive symptoms (major depressive disorder and/or dysthymia, and depressive symptoms, including depressed mood) with physical, role, and social functioning and compared results with eight chronic medical conditions using data on 11,242 adult outpatients in the Medical Outcomes Study (MOS). Ordinary least squares regression analysis was used in which depressive symptoms, eight chronic medical conditions, and sociodemographic characteristics were simultaneously controlled. These results provide estimates of risk through indirect attribution of cause. Of the measures of disability used in the MOS and the NHIS, the most comparable are role functioning and major activity limitation. Role functioning (limitations in work, housework, or school) was found worse for adults with depressive symptoms than for adults with hypertension, diabetes, arthritis, gastrointestinal problems, respiratory problems, and back problems. Adults with advanced coronary artery disease or angina had worse role functioning than adults with depressive symptoms.

Those conditions found in the MOS to have better role functioning than depression have, in the present analysis of NHIS data, low risks of major activity limitation at all ages (ranging from 3.5% for respiratory problems to 27.9% for diabetes) and low risks of work limitation among adults 18-69 years of age (ranging from 3.3% for respiratory problems to 29.0% for diabetes). Ischemic heart disease (which includes advanced coronary disease and angina) and other heart conditions have moderate risks of causing major activity limitation at all ages of 26.1 and 35.1 percent, respectively. Fourteen other conditions that were not considered in the MOS were found in the NHIS analysis to have risks of major activity limitation at all ages higher than ischemic heart disease and other heart conditions. These are mainly physical and mental impairments, but include some chronic diseases as well, in particular rheumatoid arthritis (which is not identified separately in the MOS), lung cancer, digestive cancer, and multiple sclerosis. Additional conditions identified with high risks that would likely exceed depression in risks of major activity limitation include hypertensive heart disease, black lung disease, and severe partial blindness. Thus, results from the MOS corroborate the conclusion made on the basis of the ECA results, namely that the risk of depression causing activity limitation is only moderate when compared to a more

comprehensive list of chronic physical conditions among adults.

Disability risks of mental and physical health conditions depend in part on how conditions are classified. Diagnostic procedures used with the DIS (Regier *et al.*, 1985; Gallagher, 1987; Boyd *et al.*, 1985) classify a symptom (or set of symptoms) as a mental disorder if it causes distress or disability. Thus, certain mental health conditions will have some degree of disability by definition. No similar criteria are imposed upon physical conditions in the NHIS or the ICD. It would be useful to determine to what extent disability enters into diagnosis of DSM-III-R disorders. The MOS study, however, did not find a significant difference in role functioning associated with depressive symptoms versus depressive disorders, even though depressive disorder is presumably more severe, and certainly more chronic, than depressive symptoms. Unlike the ECA, the MOS is a patient sample, not a random sample of the population, and may have higher prevalence of severe depressive symptoms.

The analysis presented in this report and discussion has shown that much variation exists in risks that chronic physical and mental conditions cause disability. The analysis presented and others discussed have measured risks of chronic conditions causing disability from cross-sectional samples. But disability risks are not static. Risks of disability for many conditions change with age. Many chronic diseases become more pernicious with age, but a few conditions apparently become more innocuous with age (such as deafness). A few conditions, such as lung cancer and pneumoconiosis, and other serious conditions with long latency are relatively highly pernicious, but their incidence occurs late in life. Some patterns result from complex dynamics that can only be inferred indirectly, if at all, from static analysis. Research based on longitudinal data is a necessary next step to explore more adequately the dynamics of disability risks of chronic conditions.

Research and policy attention must be accorded not just to rare conditions with severe consequences, but also to more common conditions with moderate to low risks of disability. For example, osteoarthritis is the most frequent disabling condition occurring among persons with disabilities. Yet, the fact that osteoarthritis is only moderately disabling suggests the need for further refinement and specification of factors associated with disability risks. Badley (1987) argues that impairment mediates disability risks. Incorporating measures of physical functioning, including mobility, motor capacity, endurance, sensory abilities, and pain, measures of social functioning, including quality of social networks, coping abilities, performance expectations, and other measures of the physical and social environment, is necessary to further explain variation among chronic conditions in disability risks. This step is also necessary to better differentiate risks that are intrinsic to chronic health conditions from those that result from individual and environmental factors and thereby serve as better guides to practice and prevention.

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Symbols

na	Not applicable
-	Quantity zero
0.0	Quantity more than zero but less than 0.05
*	Figure has error of more than 30 percent

TABLE 1. Percent of Selected Chronic Conditions Causing Limitation of Activity by Nature of Limitation and Gender, All Ages: United States, 1983-1986 (Four-Year Average)

Chronic Condition	Both Genders				Males				Females			
		Percent Causing				Percent Causing				Percent Causing		
	Number of Conditions (1,000s)	Any Activity Limitation	Major Activity Limitation	Need for Help in Basic Life Activities†	Number of Conditions (1,000s)	Any Activity Limitation	Major Activity Limitation	Need for Help in Basic Life Activities†	Number of Conditions (1,000s)	Any Activity Limitation	Major Activity Limitation	Need for Help in Basic Life Activities†
All selected chronic conditions	393,899	11.7	8.5	2.6	163,803	12.5	9.4	2.0	230,096	11.2	7.9	3.1
Skin and musculoskeletal												
Rheumatoid arthritis	1,223	51.0	39.4	14.9	321	43.9	33.6	4.4 *	902	53.6	41.5	18.7
Osteoarthritis/other arthropathies	29,245	19.6	13.8	5.3	10,351	18.3	13.7	3.4	18,893	20.4	13.8	6.3
Intervertebral disk disorders	3,987	48.7	38.2	5.3	2,212	50.4	39.3	3.6	1,775	46.6	36.8	7.4
Osteomyelitis/bone disorders	2,998	21.0	15.7	5.9	1,116	15.4	12.4	1.5 *	1,882	24.3	17.7	8.5
Bursitis	4,539	6.2	4.5	0.7 *	1,812	6.1	4.1	0.0	2,727	6.2	4.7	1.2 *
Psoriasis and dermatitis	11,329	1.9	1.3	0.1 *	4,578	1.5	0.9 *	0.0	6,751	2.2	1.5	0.2 *
Skin cancer	1,459	2.3 *	1.7 *	0.9 *	874	2.8 *	2.5 *	1.5 *	586	1.6 *	0.6 *	0.0
Other selected skin and musculoskeletal	27,747	2.1	1.6	0.4	11,502	2.8	2.2	0.4 *	16,245	1.6	1.2	0.5
Total	82,527	12.2	8.9	2.8	32,766	11.7	8.9	1.6	49,761	12.5	8.8	3.6
Impairments												
Absence of arm(s)/hand(s)	84	43.1	39.0 *	4.1 *	78	46.5	42.1 *	4.4 *	6 *	0.0	0.0	0.0
Absence of leg(s)	289	83.3	73.1	39.0	234	82.6	71.2	35.0	56 *	86.3 *	81.2 *	55.8 *
Absence of fingers, toes, feet	1,811	7.0	4.5	1.3 *	1,410	5.5	3.5 *	0.9 *	401	12.3 *	8.1 *	2.9 *
Other absence	1,031	20.8	13.3	4.4 *	451	19.9	14.2	2.6 *	581	21.4	12.7	5.8 *
Complete paralysis in extremity	617	52.7	45.5	26.1	340	50.6	47.3	23.7	277	55.3	43.3	28.9
Cerebral palsy	274	69.7	62.2	22.8	189	70.3	62.7	20.4 *	85	68.3	61.1	28.2 *
Partial paralysis in extremity	578	59.6	47.2	27.5	319	66.8	53.1	27.3	259	50.8	40.1	27.7
Paralysis in other sites (complete/partial)	247	47.8	43.7	14.1 *	138	60.0	60.0	10.9 *	109	32.4 *	23.0 *	18.0 *
Curvature of back or spine	4,689	14.7	10.6	1.4	1,443	15.4	11.6	1.2 *	3,246	14.4	10.1	1.4 *
Other orthopedic impairment of back	9,898	27.7	19.4	2.8	4,550	27.0	20.3	2.0	5,348	28.2	18.6	3.5
Orthopedic impairment in upper extremity	3,106	27.9	17.0	2.9	1,728	25.8	14.7	1.0 *	1,377	30.6	19.9	5.4
Orthopedic impairment in lower extremity	10,893	26.5	15.6	4.8	5,622	26.3	15.8	2.5	5,271	26.7	15.4	7.3
Other orthopedic impairments	316	58.7	46.2	14.3 *	154	56.6	41.8	10.0 *	161	60.8	50.3	18.4 *
Speech impairment	2,469	18.3	17.4	2.3 *	1,633	18.8	18.3	1.6 *	836	17.4	15.6	3.7 *
Blind in both eyes	396	64.5	58.8	38.1	191	74.8	70.5	48.1	205	54.9	47.8	28.8
Cataracts	5,173	10.6	6.4	4.4	1,633	10.2	5.9	2.2 *	3,541	10.8	6.6	5.4
Glaucoma	1,707	14.9	8.4	5.1	727	12.8	7.0 *	3.7 *	980	16.5	9.4	6.1
Other visual impairment/retinal disorders	8,596	14.0	10.0	5.4	5,076	11.0	8.0	3.2	3,520	18.3	12.9	8.6
Deaf in both ears	1,700	16.4	11.3	3.2 *	959	13.5	10.0	3.0 *	741	20.1	12.9	3.5 *
Other hearing impairments	19,254	4.6	2.7	0.9	10,854	4.4	2.6	0.7	8,400	4.8	2.8	1.2
Mental retardation	1,202	84.1	80.0	19.9	762	86.9	83.9	18.7	440	79.3	73.2	22.0
Other selected impairments	1,371	13.6	10.3	2.5 *	756	15.9	11.5	3.3 *	615	10.7	9.0 *	1.7 *
Total	75,701	18.5	13.1	4.1	39,247	18.1	13.3	3.1	36,455	19.0	12.8	5.1
Digestive												
Ulcers	4,469	9.7	7.0	1.0 *	2,107	11.8	9.2	0.9 *	2,362	7.8	5.1	1.1 *
Abdominal hernia	4,830	12.5	9.1	2.4	2,427	11.3	7.7	1.2 *	2,403	13.7	10.6	3.6
Enteritis and colitis	2,392	7.2	5.1	0.8 *	721	8.7	6.1 *	0.4 *	1,671	6.6	4.6	1.0 *
Cancer of digestive sites	228	45.3	40.3	15.9 *	107	45.1	37.3	10.5 *	121	45.4	42.8	20.6 *
Other selected digestive disorders	20,556	3.6	2.9	0.8	7,296	3.1	2.5	0.3 *	13,260	3.9	3.1	1.1
Total	32,475	6.3	4.8	1.2	12,658	6.8	5.1	0.7	19,817	6.0	4.6	1.5

TABLE 1. Percent of Selected Chronic Conditions Causing Limitation of Activity by Nature of Limitation and Gender, All Ages: United States, 1983-1986 (Four-Year Average), Cont.

Chronic Condition	Both Genders				Males				Females			
		Percent Causing				Percent Causing				Percent Causing		
	Number of Conditions (1,000s)	Any Activity Limitation	Major Activity Limitation	Need for Help in Basic Life Activities†	Number of Conditions (1,000s)	Any Activity Limitation	Major Activity Limitation	Need for Help in Basic Life Activities†	Number of Conditions (1,000s)	Any Activity Limitation	Major Activity Limitation	Need for Help in Basic Life Activities†
Circulatory												
Rheumatic fever	1,536	15.7	11.5	1.9 *	537	11.2	9.6 *	0.6 *	999	18.2	12.6	2.6 *
Ischemic heart disease	6,948	35.0	26.1	8.1	3,978	36.1	26.4	4.4	2,970	33.6	25.9	13.0
Heart rhythm disorders	7,404	7.2	4.7	1.5	2,735	8.1	5.6	1.4 *	4,669	6.7	4.1	1.5
Other heart disease/disorders	4,708	46.9	35.1	13.6	2,075	48.7	37.8	11.7	2,633	45.4	33.1	15.0
Hypertension	28,689	12.4	8.9	2.2	12,242	9.9	7.5	1.2	16,446	14.2	9.9	2.9
Cerebrovascular disease	2,599	38.2	33.3	22.9	1,269	39.6	36.3	20.3	1,331	36.8	30.4	25.3
Arteriosclerosis	3,008	12.1	9.4	5.1	1,532	12.0	9.6	3.8 *	1,476	12.2	9.2	6.5
Phlebitis, varicose veins	7,891	5.5	3.9	0.8	1,584	7.5	6.3	0.8 *	6,306	4.9	3.3	0.8 *
Other selected circulatory	11,519	3.8	2.7	1.2	5,153	4.0	2.8	0.8 *	6,365	3.6	2.7	1.5
Total	74,302	15.1	11.2	3.9	31,105	15.9	12.2	3.1	43,195	14.4	10.4	4.5
Respiratory												
Chronic bronchitis	11,196	3.6	2.5	0.6	4,465	3.4	2.6	0.5 *	6,732	3.8	2.5	0.7 *
Asthma	8,869	20.6	12.6	1.3	4,069	19.1	12.6	0.7 *	4,800	21.8	12.7	1.7
Hay fever	20,431	1.5	1.1	0.0	9,424	1.7	1.3	0.0	11,007	1.3	0.8	0.1 *
Sinusitis	31,969	0.4	0.3	0.1 *	13,455	0.5	0.4 *	0.1 *	18,514	0.4	0.3 *	0.1 *
Emphysema	2,074	43.6	29.8	9.6	1,399	44.0	31.3	8.4	675	42.8	26.8	12.2
Lung or bronchial cancer	200	74.8	63.5	34.5	110	79.9	65.2	32.4 *	90	68.7	61.4	37.1 *
Pneumoconiosis/asbestosis	368	38.5	29.6	8.1 *	346	40.0	30.6	8.6 *	22 *	13.7 *	13.7 *	0.0
Other selected respiratory	8,729	5.5	4.1	1.2	3,417	8.1	6.5	1.4 *	5,312	3.7	2.3	1.0 *
Total	83,836	5.2	3.5	0.7	36,685	6.2	4.5	0.8	47,152	4.4	2.7	0.7
Miscellaneous												
Diabetes	6,096	35.4	27.9	9.4	2,609	32.3	25.0	5.8	3,487	37.8	30.1	12.0
Anemias	3,409	4.6	3.4	0.3 *	547	1.5 *	1.3 *	0.0	2,862	5.2	3.8	0.3 *
Kidney disorders	3,559	9.6	7.8	2.4	1,187	9.0	7.2	1.0 *	2,371	9.9	8.1	3.2
Female genital disorders	6,379	3.7	2.4	0.2 *	na	na	na	na	6,379	3.7	2.4	0.2 *
Epilepsy	1,162	41.0	29.0	6.3	578	36.4	29.3	2.0 *	584	45.5	28.7	10.5
Multiple sclerosis	171	70.6	63.3	40.7	48 *	36.7 *	36.7 *	20.0 *	123	84.0	73.8	48.9
Migraine headache	7,934	2.9	2.2	0.3 *	2,023	4.0	3.2	0.0	5,911	2.6	1.9	0.4 *
Cancer of female breast	443	27.4	17.3	4.6 *	na	na	na	na	443	27.4	17.3	4.6 *
Cancer of genitourinary sites	302	41.8	34.7	8.5 *	100	55.3	45.7	15.3 *	202	35.2	29.3	5.1 *
Other selected miscellaneous	15,602	4.0	2.9	1.0	4,251	4.7	3.3	0.6 *	11,352	3.8	2.7	1.1
Total	45,057	10.2	7.8	2.3	11,343	13.4	10.4	2.0	33,714	9.1	6.9	2.4

* Figure has low statistical reliability or precision (relative standard error exceeds 30 percent).
† Includes Activities of Daily Living (persons aged 6 years and over) and Instrumental Activities of Daily Living (persons aged 18 years and over).
Source: National Health Interview Survey, 1983-1986. Data are estimates based on household interviews of the civilian noninstitutionalized population.
Note: ICD and impairment codes are provided in Appendix B.

TABLE 2. Percent of Selected Chronic Conditions Causing Limitation in Work by Nature of Limitation and Age: United States, 1983-1986 (Four-Year Average)

Chronic Condition	Ages 18-69				Ages 18-44				Ages 45-69			
		Percent Causing				Percent Causing				Percent Causing		
	Number of Conditions (1,000s)	Any Work Limitation	Inability to Work	Need for Help in Basic Life Activities†	Number of Conditions (1,000s)	Any Work Limitation	Inability to Work	Need for Help in Basic Life Activities†	Number of Conditions (1,000s)	Any Work Limitation	Inability to Work	Need for Help in Basic Life Activities†
All selected chronic conditions	286,710	8.6	5.4	1.3	139,267	4.7	2.0	0.6	147,443	12.3	8.6	2.0
Skin and musculoskeletal												
Rheumatoid arthritis	969	40.1	26.5	9.7	252	34.8	15.1 *	1.5 *	716	41.9	30.5	12.6
Osteoarthritis/other arthropathies	20,725	14.3	9.5	2.3	4,813	7.0	3.0	0.9 *	15,913	16.5	11.4	2.8
Intervertebral disk disorders	3,616	40.7	19.1	4.6	1,659	37.8	11.6	3.9	1,957	43.2	25.4	5.1
Osteomyelitis/bone disorders	2,308	14.1	8.9	2.9	948	10.3	5.4 *	0.8 *	1,360	16.8	11.3	4.3 *
Bursitis	3,904	4.3	2.7	0.6 *	1,465	3.0 *	1.3 *	0.0	2,438	5.1	3.4	1.0 *
Psoriasis and dermatitis	7,837	1.4	0.5 *	0.0	5,090	0.9 *	0.2 *	0.0	2,747	2.2	1.2 *	0.1 *
Skin cancer	988	1.8 *	0.0	0.6 *	206	0.0	0.0	0.0	782	2.3 *	0.0	0.7 *
Other selected skin and musculoskeletal	20,476	1.7	1.1	0.1 *	11,228	0.4 *	0.1 *	0.0	9,248	3.2	2.2	0.3 *
Total	60,823	9.5	5.7	1.4	25,661	5.0	1.8	0.5	35,161	12.8	8.5	2.1
Impairments												
Absence of arm(s)/hand(s)	64	51.6	18.0 *	5.4 *	17 *	82.7 *	0.0	0.0	46 *	39.8 *	24.8 *	7.4 *
Absence of leg(s)	207	72.9	54.9	32.7	59 *	71.2 *	23.7 *	24.7 *	148	73.5	67.3	35.8
Absence of fingers, toes, feet	1,416	5.4	2.8 *	1.1 *	605	4.8 *	2.7 *	0.0	811	5.8 *	2.9 *	1.9 *
Other absence	730	17.1	12.0	2.8 *	301	16.3 *	11.0 *	3.4 *	428	17.7	12.7	2.4 *
Complete paralysis in extremity	421	50.8	39.8	21.9	133	65.8	38.2	35.6	288	43.9	40.6	15.6 *
Cerebral palsy	157	58.2	46.7	28.0 *	134	55.7	46.3	29.8 *	23 *	72.9 *	49.2 *	17.2 *
Partial paralysis in extremity	336	55.0	46.6	22.2	94	64.0	37.0 *	7.4 *	242	51.5	50.3	28.0
Paralysis in other sites (complete/partial)	196	42.0	24.1	9.5 *	64	36.9 *	16.4 *	15.9 *	132	44.4	27.8 *	6.5 *
Curvature of back or spine	3,472	13.4	6.3	1.3 *	2,242	11.5	3.9	0.8 *	1,230	16.8	10.7	2.2 *
Other orthopedic impairment of back	8,703	21.3	8.9	2.2	5,087	16.4	5.4	1.0 *	3,617	28.2	13.9	4.0
Orthopedic impairment in upper extremity	2,491	19.8	10.2	1.9 *	1,356	18.1	7.5	0.9 *	1,135	21.9	13.3	3.0 *
Orthopedic impairment in lower extremity	8,166	15.8	7.9	2.0	4,648	11.9	4.6	0.8 *	3,518	20.9	12.2	3.5
Other orthopedic impairments	247	39.5	23.3	7.9 *	133	37.6	19.1 *	0.0	114	41.9	28.3 *	17.2 *
Speech impairment	1,186	11.2	7.6	3.3 *	701	10.1	5.6 *	3.0 *	484	12.7	10.5 *	3.7 *
Blind in both eyes	180	71.9	58.6	26.7	76	63.2	48.6	8.8 *	105	78.2	65.9	39.7
Cataracts	1,784	8.4	5.6	1.8 *	207	9.2 *	1.4 *	0.0	1,577	8.3	6.1	2.0 *
Glaucoma	853	9.4	8.6	2.1 *	158	5.5 *	3.7 *	1.6 *	695	10.3	9.8	2.2 *
Other visual impairment/retinal disorders	5,766	8.3	5.4	1.6	2,993	4.7	1.6 *	0.4 *	2,773	12.2	9.4	2.8
Deaf in both ears	868	15.8	8.2	1.7 *	235	21.7	13.2 *	3.1 *	633	13.7	6.4 *	1.2 *
Other hearing impairments	12,979	2.2	1.2	0.2 *	4,832	2.4	0.6 *	0.1 *	8,146	2.1	1.5	0.2 *
Mental retardation	520	75.3	53.1	37.4	393	75.9	48.0	37.9	127	73.6	69.0	56.1
Other selected impairments	906	12.3	6.8	2.7 *	364	8.5 *	2.6 *	0.8 *	542	14.8	9.7 *	4.1 *
Total	51,648	13.7	7.5	2.5	24,832	12.5	5.3	1.8	26,814	14.7	9.6	3.1
Digestive												
Ulcers	3,843	8.0	6.4	0.7 *	1,977	3.1	2.2 *	0.0	1,866	13.2	10.8	1.5 *
Abdominal hernia	3,299	9.8	5.3	1.0 *	922	6.0 *	0.9 *	0.0	2,377	11.2	7.0	1.4 *
Enteritis and colitis	1,772	5.8	3.3 *	0.5 *	983	4.4 *	2.1 *	0.0	789	7.5	4.8 *	1.0 *
Cancer of digestive sites	143	46.8	39.6	11.1 *	6 *	49.0 *	49.0 *	0.0	136	46.7	39.2	11.6 *
Other selected digestive disorders	15,138	2.8	1.9	0.2 *	7,394	1.3	0.8 *	0.0	7,744	4.1	3.0	0.5 *
Total	24,195	5.1	4.4	0.7	11,282	2.3	1.2	0.0	12,912	7.4	5.4	1.0

TABLE 2. Percent of Selected Chronic Conditions Causing Limitation in Work by Nature of Limitation and Age: United States, 1983-1986 (Four-Year Average), Cont.

Chronic Condition	Ages 18-69				Ages 18-44				Ages 45-69			
	Number of Conditions (1,000s)	Percent Causing			Number of Conditions (1,000s)	Percent Causing			Number of Conditions (1,000s)	Percent Causing		
		Any Work Limitation	Inability to Work	Need for Help in Basic Life Activities†		Any Work Limitation	Inability to Work	Need for Help in Basic Life Activities†		Any Work Limitation	Inability to Work	Need for Help in Basic Life Activities†
Circulatory												
Rheumatic fever	1,284	12.5	9.1	1.9 *	575	7.5 *	4.5 *	0.8 *	709	16.6	12.9	2.7 *
Ischemic heart disease	4,401	31.6	20.9	3.5	370	29.9	15.0	4.1 *	4,031	31.7	21.4	3.5
Heart rhythm disorders	4,893	5.3	3.7	0.5 *	2,540	2.1 *	1.1 *	0.3 *	2,353	8.8	6.4	0.8 *
Other heart disease/disorders	2,800	39.9	29.2	4.9	850	16.5	8.3	1.6 *	1,951	50.1	38.3	6.3
Hypertension	21,489	9.6	6.7	0.8	6,245	3.6	1.9	0.2 *	15,245	12.1	8.7	1.0
Cerebrovascular disease	1,334	32.5	28.1	14.1	173	14.4 *	10.7 *	4.2 *	1,161	35.2	30.8	15.6
Arteriosclerosis	1,395	12.0	9.7	1.9 *	48 *	5.9 *	0.0	0.0	1,347	12.2	10.0	2.0 *
Phlebitis, varicose veins	6,232	4.8	3.2	0.5 *	2,574	2.8	0.9 *	0.3 *	3,658	6.2	4.9	0.6 *
Other selected circulatory	9,796	2.3	1.8	0.4 *	5,245	0.5 *	0.3 *	0.1 *	4,551	4.3	3.5	0.8 *
Total	53,624	11.4	8.1	1.5	18,620	3.7	1.9	0.4	35,006	15.5	11.5	2.1
Respiratory												
Chronic bronchitis	6,553	2.9	1.7	0.3 *	3,815	0.9 *	0.4 *	0.1 *	2,738	5.6	3.4	0.6 *
Asthma	5,292	12.6	5.7	0.9 *	3,409	10.1	2.8	0.8 *	1,883	17.3	10.9	1.3 *
Hay fever	15,754	0.8	0.2 *	0.0	11,114	0.8	0.2 *	0.0	4,640	0.9 *	0.2 *	0.0 *
Sinusitis	25,779	0.3	0.1 *	0.0	16,079	0.1 *	0.0	0.0	9,699	0.5 *	0.3 *	0.1 *
Emphysema	1,399	38.7	28.1	7.0	116	14.2 *	11.6 *	5.9 *	1,283	40.9	29.6	7.1
Lung or bronchial cancer	99	72.7	69.9	17.6 *	15 *	73.1 *	73.1 *	20.3 *	84	72.7	69.4	17.1 *
Pneumoconiosis/asbestosis	252	35.9	34.7	2.9 *	82	0.0	0.0	0.0	169	53.3	51.5	4.3 *
Other selected respiratory	5,640	4.8	4.0	0.9 *	3,700	0.8 *	0.3 *	0.1 *	1,941	11.8	10.6	2.5 *
Total	60,768	3.3	2.0	0.4	38,330	1.4	0.4	0.1	22,437	6.6	4.8	0.9
Miscellaneous												
Diabetes	4,182	29.0	20.1	4.1	884	18.9	6.9	1.8 *	3,298	31.7	23.6	4.7
Anemias	2,427	2.8	1.8 *	0.0	1,642	1.2 *	0.8 *	0.0	785	6.1 *	3.9 *	0.0
Kidney disorders	2,735	7.5	5.5	1.4 *	1,468	3.1 *	1.5 *	0.0	1,267	12.6	10.3	3.0 *
Female genital disorders	5,473	2.5	0.8 *	0.1 *	4,066	1.3 *	0.3 *	0.0	1,406	5.9	2.4 *	0.2 *
Epilepsy	762	37.0	30.6	6.7 *	535	34.0	25.5	5.5 *	227	44.0	42.8	9.3 *
Multiple sclerosis	155	58.9	44.6	37.5	72	48.2	39.8 *	28.8 *	82	68.3	48.8	45.1
Migraine headache	6,990	2.0	1.1	0.2 *	4,879	1.7	0.8 *	0.2 *	2,111	2.5 *	1.9 *	0.3 *
Cancer of female breast	307	22.1	14.6 *	2.7 *	59 *	21.4 *	7.7 *	0.0	247	22.3	16.2 *	3.4 *
Cancer of genitourinary sites	234	29.3	28.3	1.7 *	109	7.1 *	7.1 *	3.5 *	125	48.8	46.8	0.0
Other selected miscellaneous	12,389	2.6	2.0	0.5	6,827	1.2	0.8 *	0.3 *	5,562	4.3	3.4	0.8 *
Total	35,654	7.3	5.1	1.2	20,541	3.3	1.8	0.5	15,110	12.6	9.5	2.1

* Figure has low statistical reliability or precision (relative standard error exceeds 30 percent).

† Includes Activities of Daily Living and Instrumental Activities of Daily Living.

Source: National Health Interview Survey, 1983-1986. Data are estimates based on household interviews of the civilian noninstitutionalized population.

Note: ICD and impairment codes are provided in Appendix B.

TABLE 3. Percent of Selected Chronic Conditions Causing Limitation in Work Among Males by Nature of Limitation and Age: United States, 1983-1986 (Four Year-Average)

Chronic Condition	Ages 18-69				Ages 18-44				Ages 45-69			
		Percent Causing				Percent Causing				Percent Causing		
	Number of Conditions (1,000s)	Any Work Limitation	Inability to Work	Need for Help in Basic Life Activitiest	Number of Conditions (1,000s)	Any Work Limitation	Inability to Work	Need for Help in Basic Life Activitiest	Number of Conditions (1,000s)	Any Work Limitation	Inability to Work	Need for Help in Basic Life Activitiest
All selected chronic conditions	120,476	10.0	6.0	1.2	56,836	5.8	2.4	0.6	63,640	13.8	9.2	1.7
Skin and musculoskeletal												
Rheumatoid arthritis	254	37.7	21.3	4.3 *	88	31.7 *	11.9 *	0.0	166	40.9	26.4 *	6.6 *
Osteoarthritis/other arthropathies	7,741	15.2	9.6	1.8	1,868	9.2	2.9 *	0.3 *	5,873	17.2	11.8	2.3
Intervertebral disk disorders	2,036	40.6	18.0	2.5 *	987	38.5	11.6	2.4 *	1,049	42.6	24.1	2.6 *
Osteomyelitis/bone disorders	912	12.9	8.7	1.4 *	466	13.3	7.7 *	0.0	445	12.5	9.8 *	2.8 *
Bursitis	1,612	4.6	2.7 *	0.0	630	2.4 *	1.1 *	0.0	982	6.0	3.7 *	0.0
Psoriasis and dermatitis	2,961	0.9 *	0.6 *	0.0	1,861	0.5 *	0.2 *	0.0	1,100	1.5 *	1.2 *	0.0
Skin cancer	593	2.5 *	0.0	0.9 *	97	0.0	0.0	0.0	495	3.0 *	0.0	1.1 *
Other selected skin and musculoskeletal	8,486	2.5	1.5	0.1 *	4,743	0.7 *	0.2 *	0.0	3,743	4.8	3.2	0.1 *
Total	24,595	10.3	5.8	0.9	10,740	6.5	2.2	0.3	13,853	13.4	8.7	1.4
Impairments												
Absence of arm(s)/hand(s)	58 *	57.1 *	20.0 *	6.0 *	14 *	100.0 *	0.0	0.0	43 *	42.7 *	26.7 *	8.0 *
Absence of leg(s)	180	70.8	50.2	32.4	56 *	69.7 *	19.8 *	26.0 *	124	71.4	64.0	35.3
Absence of fingers, toes, feet	1,128	4.5 *	2.2 *	0.9 *	500	3.4 *	1.4 *	0.0	627	5.4 *	2.9 *	1.5 *
Other absence	356	18.0	11.1 *	2.4 *	181	13.9 *	8.4 *	3.1 *	175	22.3 *	13.9 *	1.7 *
Complete paralysis in extremity	270	52.7	42.0	22.9	97	67.0	44.3	40.8	173	44.7	40.7	12.9 *
Cerebral palsy	112	57.5	46.1	23.5 *	102	56.0	43.6	21.9	10 *	72.6 *	72.6 *	41.0 *
Partial paralysis in extremity	199	64.7	54.2	23.9	56 *	89.3 *	56.5 *	12.4 *	144	55.3	53.2	28.4 *
Paralysis in other sites (complete/partial)	128	57.0	29.6 *	9.6 *	45 *	46.1 *	16.7 *	8.4 *	83	62.9	36.5 *	10.2 *
Curvature of back or spine	1,082	14.3	7.4	1.6 *	685	12.1	4.7 *	2.1 *	397	18.2	12.1 *	0.8 *
Other orthopedic impairment of back	4,147	21.6	9.0	1.7	2,339	16.1	5.4	1.0 *	1,808	28.7	13.5	2.6 *
Orthopedic impairment in upper extremity	1,499	16.4	7.6	1.0 *	889	15.6	6.6	0.4 *	610	17.5	9.2	1.8 *
Orthopedic impairment in lower extremity	4,554	16.6	7.5	1.2 *	2,715	12.1	4.2	0.3 *	1,839	23.3	12.4	2.5 *
Other orthopedic impairments	113	40.9	26.8 *	4.6 *	73	41.6 *	24.8 *	0.0	40 *	39.7 *	30.6 *	13.0 *
Speech impairment	802	10.4	6.6 *	2.0 *	481	10.7 *	5.4 *	3.3 *	321	10.0 *	8.5 *	0.0
Blind in both eyes	90	72.8	60.6	28.5 *	34 *	63.7 *	43.0 *	7.2 *	57 *	78.2 *	71.1 *	41.1 *
Cataracts	732	8.6	4.4 *	1.1 *	127	12.6 *	0.0	0.0	605	7.7 *	5.3 *	1.3 *
Glaucoma	395	6.7 *	6.0 *	0.6 *	92	9.3 *	6.2 *	2.7 *	303	5.9 *	5.9 *	0.0
Other visual impairment/retinal disorders	3,738	6.7	3.7	1.2 *	2,103	4.0	1.1 *	0.6 *	1,636	10.0	7.1	1.8 *
Deaf in both ears	558	13.3	5.4 *	1.3 *	141	24.7 *	12.6 *	5.2 *	417	9.4 *	3.0 *	0.0
Other hearing impairments	7,856	2.2	1.1	0.2 *	2,900	2.2	0.8 *	0.2 *	4,956	2.1	1.4	0.2 *
Mental retardation	322	79.7	55.3	37.0	261	81.4	52.3	34.9	62	72.6	68.0	46.0 *
Other selected impairments	542	12.4	7.7 *	2.7 *	217	8.1 *	1.6 *	0.0	325	15.3 *	11.7 *	4.5 *
Total	28,861	13.3	7.1	2.2	14,108	12.4	5.4	2.0	14,755	14.1	8.8	2.5
Digestive												
Ulcers	1,885	10.0	7.8	0.9 *	947	3.9 *	2.4 *	0.0	938	16.1	13.1	1.8 *
Abdominal hernia	1,741	9.6	4.4	0.8 *	559	4.3 *	0.6 *	0.0	1,182	12.1	6.2	1.2 *
Enteritis and colitis	578	7.6 *	4.1 *	0.5 *	339	4.3 *	2.2 *	0.0	239	12.2 *	6.9 *	1.2 *
Cancer of digestive sites	59 *	56.4 *	44.3 *	8.3 *	0.0	0.0	0.0	0.0	59 *	56.4 *	44.3 *	8.3 *
Other selected digestive disorders	5,641	2.8	1.8	0.0	2,915	1.4 *	0.8 *	0.0	2,726	4.4	2.8	0.1 *
Total	9,904	6.0	3.8	0.4	4,760	2.4	1.2	0.0	5,144	9.3	6.1	0.8

TABLE 3. Percent of Selected Conditions Causing Limitation in Work Among Males by Nature of Limitation and Age: United States, 1983-1986 (Four-Year Average), Cont.

Chronic Condition	Ages 18-69				Ages 18-44				Ages 45-69			
	Number of Conditions (1,000s)	Percent Causing			Number of Conditions (1,000s)	Percent Causing			Number of Conditions (1,000s)	Percent Causing		
		Any Work Limitation	Inability to Work	Need for Help in Basic Life Activities†		Any Work Limitation	Inability to Work	Need for Help in Basic Life Activities†		Any Work Limitation	Inability to Work	Need for Help in Basic Life Activities†
Circulatory												
Rheumatic fever	433	10.5 *	7.7 *	0.7 *	165	5.4 *	2.3 *	-	268	13.6 *	11.1 *	1.2 *
Ischemic heart disease	2,736	33.6	19.6	2.1 *	209	40.8	15.4 *	4.9 *	2,527	33.1	19.9	1.9 *
Heart rhythm disorders	1,722	7.0	4.4	0.7 *	867	1.9 *	1.1 *	0.4 *	855	12.2	7.6	1.1 *
Other heart disease/disorders	1,292	45.6	31.3	5.4	329	16.5	6.5 *	1.2 *	963	55.5	39.8	6.8
Hypertension	9,999	8.1	5.1	0.4 *	3,317	2.8	1.3 *	0.1 *	6,682	10.7	7.1	0.5 *
Cerebrovascular disease	721	39.5	33.0	14.3	73	14.6 *	6.0 *	6.0 *	647	42.3	36.1	15.2
Arteriosclerosis	878	13.2	10.2	3.0 *	24 *	0.0	0.0	0.0	854	13.6	10.5	3.1 *
Phlebitis, varicose veins	1,197	7.3	6.0	0.5 *	392	3.9 *	2.3 *	1.5 *	805	9.0	7.7	0.0
Other selected circulatory	4,427	2.9	2.1	0.6 *	2,253	0.4 *	0.2 *	0.2 *	2,174	5.5	4.2	1.1 *
Total	23,405	13.2	8.8	1.5	7,629	3.8	1.7	0.5	15,775	17.8	12.2	2.0
Respiratory												
Chronic bronchitis	2,251	3.5	1.4 *	0.3 *	1,353	0.6 *	0.0	0.0	898	8.0	3.6 *	0.7 *
Asthma	2,141	12.0	4.4	0.5 *	1,370	9.4	1.9 *	0.5 *	771	16.7	8.7	0.4 *
Hay fever	7,054	0.9	0.0	0.0	5,078	1.0 *	0.0	0.0	1,976	0.6 *	0.0	0.0
Sinusitis	10,698	0.4 *	0.1 *	0.0	6,666	0.2 *	0.0	0.0	4,032	0.6 *	0.3 *	0.0
Emphysema	932	41.3	29.5	5.5 *	65	10.3 *	5.6 *	5.6 *	867	43.6	31.3	5.5 *
Lung or bronchial cancer	57 *	74.7 *	69.8 *	11.4 *	12 *	65.5 *	65.5 *	26.1 *	45 *	77.1 *	71.0 *	7.6 *
Pneumoconiosis/asbestosis	230	38.0	38.0	3.2 *	63	0.0	0.0	0.0	166	52.4	52.4	4.4 *
Other selected respiratory	2,073	8.2	7.0	1.0 *	1,246	1.2 *	0.2 *	0.2 *	828	17.3	15.9	2.0 *
Total	25,436	4.4	2.7	0.4	15,853	1.5	0.3	0.1	9,583	9.2	6.6	0.9
Miscellaneous												
Diabetes	1,854	29.5	18.9	2.6 *	354	18.7	4.7 *	0.0	1,500	32.1	22.2	3.2 *
Anemias	259	2.7 *	2.7 *	0.0	99	0.0	0.0	0.0	160	4.4 *	4.4 *	0.0
Kidney disorders	919	8.7	6.6	0.6 *	409	3.3 *	2.5 *	0.0	510	13.0	9.9 *	1.1 *
Female genital disorders	na	na	na	na	na	na	na	na	na	na	na	na
Epilepsy	381	31.5	28.0	0.7 *	259	26.9	21.8	0.0	122	41.4	41.4	2.3 *
Multiple sclerosis	44 *	40.7 *	22.6 *	22.2 *	20 *	13.3 *	13.3 *	13.3 *	23 *	64.9 *	30.8 *	29.9 *
Migraine headache	1,667	2.5 *	1.9 *	0.0	1,153	2.0 *	1.4 *	0.0	514	3.5 *	3.0 *	0.0
Cancer of female breast	na	na	na	na	na	na	na	na	na	na	na	na
Cancer of genitourinary sites	50 *	60.8 *	55.7 *	0.0	0.0	0.0	0.0	0.0	50 *	60.8 *	55.7 *	0.0
Other selected miscellaneous	3,101	3.2	2.3	0.1 *	1,450	1.7 *	1.3 *	0.0	1,650	4.4	3.3 *	0.3 *
Total	8,275	11.4	8.0	0.8	3,744	5.3	3.2	0.1	4,529	16.4	12.1	1.5

* Figure has low statistical reliability or precision (relative standard error exceeds 30 percent).
† Includes Activities of Daily Living and Instrumental Activities of Daily Living.
Source: National Health Interview Survey, 1983-1986. Data are estimates based on household interviews of the civilian noninstitutionalized population.
Note: ICD and impairment codes are provided in Appendix B.

TABLE 4. Percent of Selected Chronic Conditions Causing Limitation in Work Among Females by Nature of Limitation and Age: United States, 1983-1986 (Four-Year Average)

Chronic Condition	Ages 18-69				Ages 18-44				Ages 45-69			
		Percent Causing				Percent Causing				Percent Causing		
	Number of Conditions (1,000s)	Any Work Limitation	Inability to Work	Need for Help in Basic Life Activities†	Number of Conditions (1,000s)	Any Work Limitation	Inability to Work	Need for Help in Basic Life Activities†	Number of Conditions (1,000s)	Any Work Limitation	Inability to Work	Need for Help in Basic Life Activities†
All selected chronic conditions	166,234	7.6	5.0	1.4	82,431	4.0	1.8	0.5	83,803	11.2	8.2	2.3
Skin and musculoskeletal												
Rheumatoid arthritis	715	40.9	28.3	11.7	164	36.5	16.9 *	2.3 *	550	42.3	31.7	14.5
Osteoarthritis/other arthropathies	12,984	13.7	9.4	2.6	2,945	5.7	3.1	1.2 *	10,039	16.1	11.2	3.1
Intervertebral disk disorders	1,579	40.8	20.4	7.3	671	36.7	11.6	6.2 *	908	43.8	26.9	8.1
Osteomyelitis/bone disorders	1,397	14.9	9.1	3.9 *	482	7.4 *	3.3 *	1.6 *	915	18.8	12.1	5.0 *
Bursitis	2,291	4.1	2.6 *	1.1 *	835	3.4 *	1.5 *	0.0	1,456	4.5	3.3 *	1.7 *
Psoriasis and dermatitis	4,876	1.7	0.5 *	0.1 *	3,229	1.1 *	0.2 *	0.0	1,647	2.7 *	1.2 *	0.2 *
Skin cancer	395	0.9 *	0.0	0.0	108	0.0	0.0	0.0	287	1.2 *	0.0	0.0
Other selected skin and musculoskeletal	11,990	1.1	0.7	0.2 *	6,485	0.2 *	0.1 *	0.0	5,505	2.1	1.5	0.5 *
Total	36,227	8.9	5.6	1.8	14,919	3.9	1.6	0.6	21,307	12.4	8.5	2.7
Impairments												
Absence of arm(s)/hand(s)	6 *	0.0	0.0	0.0	3 *	0.0	0.0	0.0	3 *	0.0	0.0	0.0
Absence of leg(s)	27 *	86.4 *	86.4 *	34.2 *	3 *	100.0 *	100.0 *	0.0	24 *	84.7 *	84.7 *	38.3 *
Absence of fingers, toes, feet	288	8.7 *	5.2 *	2.0 *	105	11.5 *	8.8 *	0.0	183	7.2 *	3.2 *	3.2 *
Other absence	374	16.3	12.9 *	3.2 *	120	19.9 *	14.9 *	3.9 *	254	14.6 *	11.9 *	2.9 *
Complete paralysis in extremity	151	47.6	36.0	20.1 *	36 *	62.5 *	22.1 *	21.8 *	115	42.9	40.4	19.5 *
Cerebral palsy	45 *	60.2 *	48.1 *	38.9 *	32 *	54.7 *	54.7 *	55.3 *	13 *	73.2 *	32.5 *	0.0
Partial paralysis in extremity	137	40.7	35.5	19.8 *	38 *	27.1 *	8.5 *	0.0	99	45.9	45.9	27.5 *
Paralysis in other sites (complete/partial)	68	13.8 *	13.8 *	9.4 *	19 *	15.8 *	15.8 *	33.2 *	49 *	13.0 *	13.0 *	0.0
Curvature of back or spine	2,391	12.9	5.9	1.1 *	1,557	11.2	3.6 *	0.2 *	833	16.2	10.1	2.9 *
Other orthopedic impairment of back	4,557	21.0	8.9	2.8	2,748	16.5	5.3	1.1 *	1,809	27.7	14.4	5.4
Orthopedic impairment in upper extremity	992	25.1	14.0	3.2 *	467	22.9	9.3 *	1.9 *	525	27.0	18.1	4.4 *
Orthopedic impairment in lower extremity	3,612	14.7	8.3	3.0	1,932	11.7	5.0	1.6 *	1,679	18.2	12.0	4.6
Other orthopedic impairments	134	38.4	20.3 *	10.8 *	60 *	32.7 *	12.1 *	0.0	74	43.0 *	27.0 *	19.5 *
Speech impairment	383	12.9 *	9.6 *	6.1 *	220	8.9 *	6.1 *	2.5 *	163	18.2 *	14.3 *	11.0 *
Blind in both eyes	90	71.0	56.7	25.0 *	42 *	62.9 *	53.1 *	10.2 *	48 *	78.1 *	59.9 *	38.1 *
Cataracts	1,052	8.3	6.4	2.3 *	80	3.7 *	3.7 *	0.0	972	8.6	6.6	2.5 *
Glaucoma	458	11.7 *	10.9 *	3.4 *	66	0.0	0.0	0.0	392	13.7	12.8 *	3.9 *
Other visual impairment/retinal disorders	2,028	11.3	8.3	2.3 *	891	6.3 *	2.7 *	0.0	1,137	15.2	12.8	4.2 *
Deaf in both ears	309	20.5	13.3 *	2.5 *	94	17.2 *	14.1 *	0.0	215	21.9 *	12.9 *	3.7 *
Other hearing impairments	5,123	2.4	1.2	0.1 *	1,933	2.7 *	0.4 *	0.0	3,190	2.2	1.7 *	0.1 *
Mental retardation	197	68.1	49.5	38.1	132	65.0	39.4	43.8	65	74.5	69.9	26.7 *
Other selected impairments	364	12.0 *	5.6 *	2.8 *	146	9.3 *	4.1 *	1.9 *	217	13.9 *	6.7 *	3.4 *
Total	22,786	14.1	8.0	2.8	10,724	12.5	5.2	1.7	12,059	15.5	10.6	3.9
Digestive												
Ulcers	1,957	6.1	5.1	0.5 *	1,030	2.4 *	2.1	0.0	928	10.2	8.4	1.1 *
Abdominal hernia	1,558	10.0	6.4	1.2 *	364	8.5 *	1.2 *	0.0	1,195	10.4	7.9	1.6 *
Enteritis and colitis	1,194	4.9	2.8 *	0.5 *	644	4.4 *	2.0 *	0.0	550	5.5 *	3.8 *	1.0 *
Cancer of digestive sites	83	40.0 *	36.3 *	13.1 *	6 *	49.0 *	49.0 *	0.0	77	39.3 *	35.2 *	14.1 *
Other selected digestive disorders	9,498	2.7	2.0	0.3 *	4,479	1.3 *	0.8 *	0.0	5,019	4.0	3.0	0.7 *
Total	14,290	4.4	3.2	0.5	6,523	2.2	1.2	0.0	7,769	6.2	4.8	1.0

TABLE 4. Percent of Selected Chronic Conditions Causing Limitation in Work Among Females by Nature of Limitation and Age: United States, 1983-1986 (Four-Year Average), Cont.

Chronic Condition	Ages 18-69				Ages 18-44				Ages 45-69			
		Percent Causing				Percent Causing				Percent Causing		
	Number of Conditions (1,000s)	Any Work Limitation	Inability to Work	Need for Help in Basic Life Activities†	Number of Conditions (1,000s)	Any Work Limitation	Inability to Work	Need for Help in Basic Life Activities†	Number of Conditions (1,000s)	Any Work Limitation	Inability to Work	Need for Help in Basic Life Activities†
Circulatory												
Rheumatic fever	851	13.5	9.8	2.5 *	409	8.4 *	5.3 *	1.. *	442	18.3	14.0	3.7 *
Ischemic heart disease	1,665	28.1	23.1	5.8	160	15.7 *	14.5 *	3.2 *	1,504	29.4	24.0	6.1
Heart rhythm disorders	3,171	4.4	3.3	0.4 *	1,673	2.2 *	1.1 *	0.2 *	1,498	6.9	5.7	0.6 *
Other heart disease/disorders	1,508	35.0	27.4	4.4	520	16.6	9.5 *	1.9 *	988	44.8	36.9	5.8 *
Hypertension	11,490	11.0	8.0	1.1	2,927	4.5	2.5	0.2 *	8,563	13.3	9.9	1.4
Cerebrovascular disease	613	24.3	22.4	13.8	100	14.2 *	14.2 *	2.8 *	514	26..	24.0	16.0
Arteriosclerosis	517	9.9 *	8.8 *	0.0	25 *	11.5 *	0.0	0.0	493	9.8 *	9.2 *	0.0
Phlebitis, varicose veins	5,034	4.2	2.6	0.5 *	2,182	2.6 *	0.7 *	0.1 *	2,853	5.4	4.0	0.7 *
Other selected circulatory	5,370	1.8	1.5	0.2 *	2,992	0.6 *	0.4 *	0.0	2,377	3.3	2.9	0.6 *
Total	30,219	10.0	7.6	1.5	10,988	3.7	2.1	0.3	19,232	13.6	10.8	2.1
Respiratory												
Chronic bronchitis	4,302	2.5	1.8	0.3	2,463	1.2 *	0.6 *	0.1 *	1,840	4.4	3.3	0.6 *
Asthma	3,151	13.1	6.6	1.3 *	2,039	10.5	3.3	0.9 *	1,113	17.7	12.5	1.9 *
Hay fever	8,700	0.8	0.3 *	0.0	6,036	0.6 *	0.3 *	0.1 *	2,664	1.1 *	0.3 *	0.0
Sinusitis	15,081	0.2 *	0.1 *	0.1 *	9,414	0.1 *	0.0	0.0	5,667	0.3 *	0.2 *	0.1 *
Emphysema	467	33.6	25.4	10.0 *	51 *	19.2 *	19.2 *	6.3 *	416	35.4	26.2	10.4 *
Lung or bronchial cancer	43 *	70.1 *	70.1 *	25.8 *	3 *	100.0 *	100.0 *	0.0	39 *	67.6 *	67.6 *	28.0 *
Pneumoconiosis/asbestosis	22 *	13.7 *	0.0	0.0	19 *	0.0	0.0	0.0	3 *	100.0 *	0.0	0.0
Other selected respiratory	3,567	2.6	2.1	0.9 *	2,454	0.6 *	0.4 *	0.0	1,110	6.9	5.9	2.9
Total	35,333	2.6	1.6	0.4	22,479	1.4	0.5	0.1	12,852	4.5	2.8	0.7
Miscellaneous												
Diabetes	2,327	28.6	21.1	5.4	529	19.0	8.4 *	3.0 *	1,798	31.4	24.8	6.1
Anemias	2,168	2.8	1.7 *	0.0	1,543	1.3 *	0.8 *	0.0	626	6.6 *	3.8 *	0.0
Kidney disorders	1,816	6.9	5.0	1.7 *	1,059	3.0 *	1.1 *	0.0	757	12.2	10.5	4.2 *
Female genital disorders	5,473	2.5	0.8 *	0.1 *	4,066	1.3 *	0.3 *	0.0	1,406	5.9	2.4 *	0.2 *
Epilepsy	381	42.5	33.3	12.6 *	276	40.7	29.0	10.7 *	106	47.1	44.4	17.4 *
Multiple sclerosis	111	66.0	53.2	43.5	52 *	61.8 *	50.2 *	34.9 *	59 *	69.6 *	55.8 *	51.1 *
Migraine headache	5,323	1.8	0.9 *	0.3 *	3,726	1.6 *	0.6 *	0.2 *	1,597	7.2 *	1.5 *	0.4 *
Cancer of female breast	307	22.1	14.6 *	2.7 *	59 *	21.4 *	7.7 *	0.0	247	22.3	16.2 *	3.4 *
Cancer of genitourinary sites	184	20.8 *	20.8 *	2.1 *	109	7.1 *	7.1 *	3.5 *	75	40.9 *	40.9 *	0.0
Other selected miscellaneous	9,288	2.4	1.8	0.7	5,377	1.0 *	0.7 *	0.4 *	3,911	4.3	3.5	1.0 *
Total	27,378	6.0	4.2	1.3	16,796	2.9	1.5	0.6	10,582	11.0	8.5	2.3

* Figure has low statistical reliability or precision (relative standard error exceeds 30 percent).

† Includes Activities of Daily Living and Instrumental Activities of Daily Living.

Source: National Health Interview Survey, 1983-1986. Data are estimates based on household interviews of the civilian noninstitutionalized population.

Note. ICD and impairment codes are provided in Appendix B.

TABLE 5. Percent of Selected Chronic Conditions Causing Activity Limitation by Nature of Limitation, Ages 65 and Older, by Gender: United States, 1983-1986 (Four-Year Average)

Chronic Condition	Both Genders				Males				Females			
		Percent Causing				Percent Causing				Percent Causing		
	Number of Conditions (1,000s)	Any Activity Limitation	Need for Help in Basic Life Activities†	Need for Help in ADL Only§	Number of Conditions (1,000s)	Any Activity Limitation	Need for Help in Basic Life Activities†	Need for Help in ADL Only§	Number of Conditions (1,000s)	Any Activity Limitation	Need for Help in Basic Life Activities†	Need for Help in ADL Only§
All selected chronic conditions	104,961	16.6	6.9	2.7	38,971	17.0	5.6	2.7	65,990	16.4	7.8	2.8
Skin and musculoskeletal												
Rheumatoid arthritis	368	63.6	30.4	12.0 *	85	53.7	3.7 *	3.7 *	283	66.5	38.4	14.5 *
Osteoarthritis/other arthropathies	12,426	24.1	9.4	3.3	4,039	20.3	6.2	2.5	8,387	25.9	11.0	3.7
Intervertebral disk disorders	669	41.1	9.6	1.5 *	327	48.6	12.6 *	2.1 *	343	34.0	6.7 *	0.9 *
Osteomyelitis/bone disorders	863	31.2	15.2	4.8 *	190	18.5 *	5.7 *	0.6 *	673	34.8	17.9	6.0 *
Bursitis	1,047	5.2 *	1.0 *	0.4 *	342	4.9 *	0.0	0.0	705	5.3 *	1.4 *	0.5 *
Psoriasis and dermatitis	1,345	2.9 *	0.6 *	0.0	520	3.2 *	0.0	0.0	824	2.7 *	0.9 *	0.0
Skin cancer	662	1.9 *	1.9 *	1.9 *	389	3.3 *	3.3 *	3.3 *	273	0.0	0.0	0.0
Other selected skin and musculoskeletal	6,246	4.5	1.6	0.4 *	2,236	7.1	1.8 *	0.7 *	4,010	3.0	1.6	0.3 *
Total	23,626	17.6	6.7	4.5	8,128	15.1	4.4	2.7	15,498	18.7	8.1	2.6
Impairments												
Absence of arm(s)/hand(s)	28 *	12.1 *	12.1 *	12.1 *	25 *	13.6 *	13.6 *	13.6 *	3 *	0.0	0.0	0.0
Absence of leg(s)	123	85.6	58.6	18.2 *	82	83.1	57.5	9.1 *	41 *	90.6 *	60.9 *	36.3 *
Absence of fingers, toes, feet	510	5.4 *	2.8 *	1.1 *	369	3.4 *	0.8 *	0.0	140	10.6 *	8.2 *	4.0 *
Other absence	348	21.9	10.1 *	3.3 *	105	20.7 *	5.9 *	0.0	243	22.4	11.8 *	4.7 *
Complete paralysis in extremity	235	47.5	31.7	27.2	100	42.4	24.3 *	24.3 *	136	51.2	37.2	29.4 *
Cerebral palsy	9 *	46.6 *	46.6 *	46.6 *	-	-	-	-	9 *	46.6 *	46.6 *	46.6 *
Partial paralysis in extremity	289	63.0	40.2	23.0	161	70.1	38.9	30.1	127	54.1	41.9	14.0 *
Paralysis in other sites (complete/partial)	82	52.3	26.1 *	21.7 *	29 *	80.3 *	28.2 *	28.2 *	53 *	37.1 *	24.9 *	18.1 *
Curvature of back or spine	892	10.0	2.9 *	0.4 *	194	5.9 *	0.0	0.0	698	11.2	3.7 *	0.5 *
Other orthopedic impairment of back	1,559	29.0	6.5	1.5 *	595	29.0	3.9 *	1.7 *	964	29.1	8.1	1.4 *
Orthopedic impairment in upper extremity	675	20.7	7.8 *	3.1 *	265	9.3 *	1.2 *	0.0	410	28.0	12.1 *	5.1 *
Orthopedic impairment in lower extremity	2,135	35.7	18.2	6.5	705	31.6	13.1	5.0 *	1,430	37.7	20.7	7.2
Other orthopedic impairments	66	63.0	33.5 *	19.1 *	21 *	88.5 *	47.6 *	35.2 *	44 *	50.6 *	26.8 *	11.3 *
Speech impairment	280	12.2 *	8.1 *	6.4 *	153	10.1 *	6.3 *	6.3 *	127	14.8 *	10.2 *	6.5 *
Blind in both eyes	207	63.5	54.1	27.0	111	78.8	67.9	26.5 *	96	45.7	38.1 *	27.5 *
Cataracts	4,000	10.6	5.1	1.1 *	1,087	9.9	2.9 *	0.9 *	2,912	10.9	6.0	1.2 *
Glaucoma	1,063	16.6	7.1	2.6 *	394	17.2	6.1 *	2.0 *	668	16.2	7.7 *	3.0 *
Other visual impairment/retinal disorders	2,784	21.6	13.8	2.7	1,201	19.1	10.2	2.4 *	1,582	23.5	16.5	3.0 *
Deaf in both ears	904	13.6	4.4 *	0.9 *	480	13.5	4.5 *	1.0 *	425	13.8	4.2 *	0.8 *
Other hearing impairments	7,217	5.4	2.2	0.7 *	3,516	5.3	1.7 *	0.4 *	3,701	5.4	2.7	1.0 *
Mental retardation	32 *	49.7 *	33.7 *	16.3 *	13 *	100.0 *	61.1 *	39.5 *	19 *	14.4 *	14.4 *	0.0
Other selected impairments	465	10.2 *	2.7 *	2.1 *	243	19.5 *	5.3 *	4.1 *	222	0.0	0.0	0.0
Total	23,903	16.6	8.1	5.3	9,849	15.7	6.5	3.9	14,050	17.3	9.3	3.0
Digestive												
Ulcers	936	15.6	3.0 *	0.4 *	415	19.7	2.1 *	1.0 *	521	12.3	3.7 *	0.0
Abdominal hernia	1,867	14.9	4.7	1.9 *	735	15.4	2.4 *	1.8 *	1,132	14.5	6.2	2.0 *
Enteritis and colitis	557	9.9 *	3.5 *	1.7 *	102	9.5 *	2.7 *	2.7 *	455	10.0 *	3.8 *	1.5 *
Cancer of digestive sites	124	36.6	22.5 *	13.0 *	58 *	44.1 *	19.3 *	14.4 *	66	30.0 *	25.4 *	11.8 *
Other selected digestive disorders	6,198	5.3	2.5	0.9 *	1,779	4.1	1.0 *	0.7 *	4,418	5.8	3.1	1.0 *
Total	9,682	8.8	3.3	2.0	3,089	9.8	1.9 *	0.6 *	6,592	8.3	4.0	1.2

TABLE 5. Percent of Selected Chronic Conditions Causing Activity Limitation by Nature of Limitation, Ages 65 and Older, by Gender: U. S., 1983-1986 (Four-Year Average), Cont.

Chronic Condition	Both Genders				Males				Females			
	Number of Conditions (1,000s)	Percent Causing: Any Activity Limitation	Percent Causing: Need for Help in Basic Life Activities†	Percent Causing: Need for Help in ADL Only§	Number of Conditions (1,000s)	Percent Causing: Any Activity Limitation	Percent Causing: Need for Help in Basic Life Activities†	Percent Causing: Need for Help in ADL Only§	Number of Conditions (1,000s)	Percent Causing: Any Activity Limitation	Percent Causing: Need for Help in Basic Life Activities†	Percent Causing: Need for Help in ADL Only§
Circulatory												
Rheumatic fever	324	25.3	3.6 *	0.6 *	108	16.0 *	0.0	0.0	216	29.9	5.2 *	0.8 *
Ischemic heart disease	3,789	34.2	12.3	4.3	1,940	33.5	7.1	3.5	1,849	35.0	17.6	5.1
Heart rhythm disorders	2,047	11.5	4.0	1.8 *	667	15.1	4.5 *	1.6 *	1,381	9.9	3.8 *	1.9 *
Other heart disease/disorders	2,203	54.5	24.0	9.5	884	57.8	21.2	9.7	1,319	52.3	26.0	9.4
Hypertension	10,713	14.8	4.6	1.3	3,590	13.9	3.1	1.3 *	7,124	15.2	5.3	1.3
Cerebrovascular disease	1,631	37.6	28.5	19.9	776	36.9	25.5	19.3	855	38.2	31.3	20.5
Arteriosclerosis	2,059	11.9	6.7	4.2	889	10.7	4.8 *	4.0 *	1,170	12.8	8.1	4.4 *
Phlebitis, varicose veins	2,393	4.1	1.6 *	0.6 *	556	5.0 *	1.1 *	0.5 *	1,838	3.9	1.7 *	0.6 *
Other selected circulatory	2,558	9.4	4.3	1.5 *	1,058	10.0	2.6 *	0.9 *	1,500	8.9	5.4	1.8 *
Total	27,717	20.2	8.4	3.7	10,468	21.7	7.1	3.9	17,252	19.1	9.2	3.5
Respiratory												
Chronic bronchitis	1,631	9.0	3.2 *	1.3 *	528	8.3 *	3.5 *	2.2 *	1,103	9.3	3.1 *	0.9 *
Asthma	1,061	26.3	6.3	1.4 *	435	24.2	3.2 *	2.4 *	626	27.8	8.3 *	0.6 *
Hay fever	1,663	1.5 *	0.3 *	0.0	612	1.0 *	0.0	0.0	1,051	1.8 *	0.5 *	0.0
Sinusitis	4,298	1.4 *	0.6 *	0.2 *	1,573	1.6 *	0.5 *	0.5 *	2,725	1.3 *	0.6 *	0.0
Emphysema	1,116	45.1	12.4	5.1 *	763	44.7	10.3	6.2 *	354	46.0	16.9	2.6 *
Lung or bronchial cancer	115	73.9	44.9	23.5 *	64	82.2	45.2 *	22.5 *	50 *	63.2 *	44.7 *	24.9 *
Pneumoconiosis/asbestosis	175	51.5	6.3 *	6.5 *	172	50.6	6.4 *	6.6 *	3 *	100.0 *	0.0	0.0
Other selected respiratory	967	18.1	6.8	3.7 *	373	23.5	7.2 *	2.6 *	594	13.2	6.3 *	4.7 *
Total	11,026	12.4	3.8	1.6	4,520	16.4	4.1	2.5	6,506	9.3	3.5	1.0
Miscellaneous												
Diabetes	2,572	38.0	17.5	8.4	1,019	30.9	11.5	4.7 *	1,553	42.7	21.4	10.8
Anemias	564	6.8 *	1.6 *	0.6 *	132	0.0	0.0	0.0	431	8.9 *	2.0 *	0.7 *
Kidney disorders	787	16.1	8.1	5.5 *	297	15.6 *	3.9 *	2.8 *	490	16.4	10.6 *	7.1 *
Female genital disorders	763	6.1 *	1.2 *	0.0	na	na	na	na	763	6.1 *	1.2 *	0.0
Epilepsy	104	32.2 *	16.0 *	2.8 *	58 *	12.9 *	0.0	0.0	46 *	56.6 *	29.0 *	6.3 *
Multiple sclerosis	19 *	75.3 *	75.4 *	61.1 *	5 *	0.0	0.0	0.0	15 *	100.0 *	0.0	81.1
Migraine headache	471	5.4 *	2.0 *	1.4 *	80	3.3 *	0.0	0.0	391	5.9 *	2.4 *	1.7 *
Cancer of female breast	197	23.5 *	8.3 *	2.2 *	na	na	na	na	197	23.5 *	8.3 *	2.2 *
Cancer of genitourinary sites	93	45.3	23.4 *	20.5 *	70	46.4 *	21.7 *	17.9 *	23 *	42.1 *	28.4 *	28.4 *
Other selected miscellaneous	3,436	6.6	2.5	1.0 *	1,252	7.7	1.8 *	1.0 *	2,184	5.9	2.9	1.0 *
Total	9,006	17.5	7.8	3.8	2,913	17.1	6.1	2.8	6,093	17.7	8.7	4.2

* Figure has low statistical reliability or precision (relative standard error exceeds 30 percent).
† Includes Activities of Daily Living and Instrumental Activities of Daily Living.
Source: National Health Interview Survey, 1983-1986. Data are estimates based on household interviews of the civilian noninstitutionalized population.
Note: ICD and impairment codes are provided in Appendix B.

Appendix A

Technical Notes on Methods

The information presented in this report is based on analysis of National Health Interview Survey (NHIS) public use data tapes. The NHIS is a continuing national household probability sample. Information is collected each year on the personal, sociodemographic, and health characteristics of approximately 120,000 persons in 40,000 households.

The sample design is a complex multistage probability frame. A sample is drawn each week to represent the U.S. non-institutionalized civilian population. The weekly samples are independent and can yield weekly, quarterly, and annual estimates.

More detailed information on the sample design and collection and processing of the data can be found in annual reports titled *Current Estimates*, Appendix I (for example, see Schoenborn & Marano, 1988).

Estimation

Because the NHIS is a complex multistage probability sample, to obtain national estimates it is necessary to employ weights in all estimation procedures. The public use tapes provide a basic person weight, which was used to inflate each observation by the inverse of the probability of selection and to correct for other aspects of the survey design and household non-response. Further details on weighting can be found in *Current Estimates*, Appendix I (Schoenborn & Marano, 1988). All estimates were obtained using the SAS procedure PROC TABULATE. Estimates pertaining to numbers of conditions are rounded to the nearest thousand.

Reliability of Estimates

The relative standard error is the measure of sampling error used in NCHS publications and in this report. It is a measure of the random variation that might occur because the NHIS is a sample and not a complete enumeration of the population. The relative standard error (RSE) of an estimate is obtained by dividing the standard error (SE) of the estimate by the estimate itself:

$$RSE(x) = \frac{SE(x)}{x} \qquad (A.1)$$

NCHS deems that estimates with greater than 30 percent RSE are statistically unreliable, a convention followed in this report.

NCHS estimates relative variance curves for classes of estimates by fitting regression equations to variances obtained by the balanced half-sample method. The curve-fitting procedure assumes that the relative variance of an estimate is a decreasing function of the magnitude of the estimate:

$$RVAR(x) = a + \frac{b}{x} \qquad (A.2)$$

where a and b are the fitted regression estimates.

Therefore

$$SE(x) = x\ RSE(x) = x\sqrt{RVAR(x)} = \sqrt{ax^2 + bx} \qquad (A.3)$$

The method used in this report for determining the errors of estimates is the same as that used in NCHS publications. Regression parameters for estimates of chronic conditions are shown in Table A.1.

Four years of data were pooled together, and special consideration is necessary for calculating the 30 percent RSE cutoff points. A general formula for computing the 30 percent RSE cutoff point is provided below for any number of pooled years (assuming equal sample sizes).

$$CP = \frac{\sum b_y / n^2}{(.3)^2 - \sum a_y / n^2} \qquad (A.4)$$

where CP is the 30 percent relative standard error cutoff point and a_y and b_y are the regression parameters for each year and n is the total number of years.

For prevalence data (estimates of the number of conditions), the 30 percent RSE cutoff point is computed to be:

$$CP = \frac{(22{,}662.9+22{,}662.9+18{,}253.6+24{,}682.6)/16}{.09-[(1.0 \times 10^{-6}+1.0 \times 10^{-6}+1.4 \times 10^{-4}+3.5 \times 10^{-4})]/16}$$

$$= 61{,}314$$

$$\approx 61{,}000 \qquad (A.5)$$

An estimated prevalence that is less than 61,000 has greater than 30 percent relative standard error and is flagged by an asterisk (*).

To calculate the standard error of an estimate (x) of the number of conditions, use formula (A.3) with $a = 3.1 \times 10^{-5}$ and b= 5,516.4 For example, an estimate of 61,314 persons has a standard error of 18,394.

Hypothesis Testing

Tests of differences between two statistics (mean, percent, or rate) are performed using Student's t-test as shown below:

$$t = \frac{x_1 - x_2}{\sqrt{SE^2(x_1) + SE^2(x_1)}} \qquad (A.6)$$

For two-tailed tests, if $t \geq 2.0$, the result is significant at the 95 percent confidence level; if $t \geq 2.6$, the result is significant at the 99 percent confidence level. This test is accurate for uncorrelated estimates and is approximate in other cases.

Table A.1. Estimated Relative Variance Parameters for NHIS Aggregate Chronic Condition Prevalence Data, 1983-1986

Year	a	b
1983	1.0×10^{-6}	22,662.9
1984	1.0×10^{-6}	22,662.9
1985	1.4×10^{-4}	18,253.6
1986	3.5×10^{-4}	24,682.6

Source: NCHS *Current Estimates* and unpublished data from NCHS. (for 1983 and 1984)

Appendix B

Condition and Impairment Codes

Table B.1 presents the list of chronic conditions used in this report and their codes as defined by the Ninth Revision of the International Classification of Diseases (ICD), as adapted for use in the NHIS. NCHS employs a special listing of impairments with codes beginning with 'X', which are used in place of any ICD codes to which an impairment may be classifiable (TABLE B.2). The revised Recode C listing is a modified version of the condition lists provided on the NHIS public use tapes (Recodes B and C). 62 separate condition groups are used in this list.

TABLE B.1. List of Detailed Condition Codes, National Health Interview Survey, 1983-86

Revised Recode C List	*Chronic Condition*	*ICD-9 Codes as Adapted by NCHS*
	Skin and musculoskeletal	
100	Rheumatoid arthritis	714
101	Osteoarthritis/other arthropathies	711.0,9, 712.8,9, 715-716, 720.0, 721
105	Intervertebral disk disorders	722
107	Osteomyelitis/bone disorders	726.9, 730.0-3,9, 731.0,2, 732, 733
109	Bursitis	726.0-8, 727.0,2,9
113	Psoriasis and dermatitis	690-694, 696
119	Skin cancer	172, 173
121	Other skin and musculoskeletal	216, 274, 698, 698.9, 700-703, 706, 707, 724.2,3, 727.1, 729.0
	Impairments	
210	Absence of arm(s)/hand(s)	X20, X21, X23, X24
212	Absence of leg(s)	X26, X28
213	Absence of fingers, toes, feet	X22, X25, X27, X29, X35
217	Other absence	X31, X34
222	Complete paralysis in extremity	X40-X49
223	Cerebral palsy	X50
226	Partial paralysis in extremity	X51-X59
227	Paralysis in other sites (complete/partial)	X60-X64
228	Curvature of back or spine	X70
229	Other orthopedic impairment of back	X80
233	Orthopedic impairment in upper extremity	X73, X74, X84
236	Orthopedic impairment in lower extremity	X75-X78, X85, X86
237	Other orthopedic impairments	X79, X89
238	Speech impairment	X10, X11
201	Blind in both eyes	X00
241	Cataracts	366
242	Glaucoma	365
243	Other visual impairment/retinal disorders	361, 362, X01-X03
203	Deaf in both ears	X05
244	Other hearing impairments	X06-X09

TABLE B.1. List of Detailed Condition Codes, National Health Interview Survey, 1983-86, Cont.

Revised Recode C List	*Chronic Condition*	*ICD-9 Codes as Adapted by NCHS*
	Impairments, continued	
245	Mental retardation	X19
245	Other selected impairments	X12, X30, X71, X91
	Digestive	
305	Ulcers	531-533
306	Abdominal hernia	550-553
311	Enteritis and colitis	555, 556, 558
316	Cancer of digestive sites	151-154
317	Other digestive disorders	530, 534-537, 560, 562, 564.0-1, 569-573.0,3-9, 574, 787
	Circulatory	
501	Rheumatic fever	390, 392, 394. 295, 397, 399-NHIS code only
502	Ischemic heart disease	410-414, 429.6
505	Heart rhythm disorders	427.0-6,8,9, 785.0-2
507	Other heart disease/disorders	415-417, 420.9, 421.0,9, 423, 424, 425.0-5,9, 426, 428, 429.0-5,8.9, 745, 746
508	Hypertension	401-404
509	Cerebrovascular disease	430, 431, 433-435, 437
510	Arteriosclerosis	440
513	Phlebitis, varicose veins	451, 454
516	Other circulatory	441, 443, 455, 459
	Respiratory	
601	Chronic bronchitis	490, 491
602	Asthma	493
605	Sinusitis	473
606	Hay fever	477
609	Emphysema	492
610	Pneumoconiosis/asbestosis	500-502, 504
613	Lung or bronchial cancer	160, 162.2-9
616	Other respiratory disease	11, 19, 161, 470, 471, 476, 511, 515, 518
	Miscellaneous	
403	Diabetes	250
404	Anemias	280-285
405	Epilepsy	345
406	Migraine headache	346
411	Kidney disorders	581-583, 590, 592, 593
415	Multiple sclerosis	340
420	Female genital disorders	614-629, X32
421	Cancer of female breast	174
426	Cancer of genitourinary sites	179, 180, 183-185
427	Other selected miscellaneous	217-221, 240-246, 594-596, 600-602, 729, 784

TABLE B.2. List of Detailed Impairment Codes, National Health Interview Survey, 1983-86

Y-Code	*Impairment*
	Visual, Hearing, Speech, Intelligence
X00	Blind in both eyes.
X01	Visual impairment in both eyes.
X02	Blind in one eye, visually impaired in the other eye.
X03	Blind or visually impaired in one eye only; other eye, good vision or not mentioned.
X05	Deafness, both ears.
X06	Other hearing impairment involving both ears. Any bilateral hearing impairment which cannot be coded to X05.
X07	Deafness or hearing impairment of any degree involving only one ear.
X08	Deafness, NOS.
X09	Impaired hearing, NOS.
X10	Stammering and Stuttering.
X11	Other speech defects.
X12	Loss or impairment of sensation.
X14	Special learning disability (reading) (mathematics) (mirror writing or reading). Does not include learning disability resulting only from deficiency in intelligence.
X19	Mental retardation: Any degree or any type, including "mongolism."
	Absence
X20	Arms, both.
X21	Hands, both.
X22	One or more fingers (excludes tip only-below first joint).
X23	Arm, one. Person may also have X24 or X25.
X24	Hand, one. Person may also have X23 or X25.
X25	One or more fingers (excludes tip only-below first joint), thumb, of only one hand. Person may also have X23 or X24.
X26	Legs, both.
X27	Feet or toes (excludes tip only-below first joint) only, both.
X28	Leg, one. Person may also have X29.
X29	Foot or toes (excludes tip only-below first joint) only, one. Person may also have X28.
X30	Lung.
X31	Kidney.
X32	Breast.
X33	Rib, bone, joint, or muscle of trunk, one or more.
X34	Bone, joint, or muscle of extremity (including hip) without loss of extremity, one or more.
X35	Tips of fingers or toes (below first joint) only.
	Paralysis
X40	Entire body or four limbs (Prohibits X41-X62).
X41	One side of body only, including limbs; or "hemiplegia." (Prohibits X42, X44, X46, or X48).
X42	Arms, both. (Prohibits X43-X45).
X43	Arm, one. (Prohibits X44).
X44	Hands, both, and/or finger(s) (thumb) on one or both hands only. (Prohibits X45).
X45	Hand, one, and/or finger(s) (thumb) on one hand, only.
X46	Legs, both; or "paraplegia." (Prohibits X47-X49).
X47	Leg, one. (Prohibits X48).
X48	Feet, both, and/or toe(s) on one or both feet, only. (Prohibits X49).
X49	Foot, one, and/or toe(s) on one foot, only.
X50	Hands, both, and/or finger(s) (thumb) on one or both hands only. (Prohibits X55).
X51	One side of body only, including limbs; or "hemiparesis." (Prohibits X52, X54, X56, or X58).
X52	Arms, both. (Prohibits X53-X55).
X53	Arm, one. (Prohibits X54).
X54	Hands, both, and/or finger(s) (thumb) on one or both hands only. (Prohibits X55).
X56	Hand, one, and/or finger(s) (thumb) on one hand only.
X56	Legs, both; or "paraparesis." (Prohibits X57-X59).

TABLE B.2. List of Detailed Impairment Codes, National Health Interview Survey, 1983-86, Cont.

X-Code	Impairment
	Paralysis, continued
X57	Leg, one. (Prohibits X58).
X58	Feet, both, and/or toe(s) on one or both feet, only. (Prohibits X59).
X59	Foot, one, and/or toe(s) on one foot, only.
X60	Trunk, any part except parts included in X40, X41, or X51. If partial paralysis of entire body is indicated, code X60 only.
X61	Face (Bell's palsy or paralysis).
X62	Bladder or anal sphincter.
X63	Paralysis, complete or partial, sites NOT of extremities, trunk, nor affecting special senses or speech.
X64	Paralysis, complete or partial, NEC.
	Orthopedic impairments or deformities
X70	Curvature and other structural deformities of spine or back, except as in X71.9. Includes: all structural deformities of spine or back except spina bifida (X71.9). Prohibits: chronic back conditions NEC in X80.
X71	Spina bifida (with meningocele) (always congenital). Prohibits: X80.
X73	Deformity of shoulder or upper extremity. Excludes: deformity of hand(s), finger(s), thumb(s), only. (Prohibits X74).
X74	Deformity of hand(s), finger(s), thumb(s), only.
X75	Dislocation, congenital, and other deformity hip and/or pelvis.
X76	Deformity of any site on lower extremity, one or both. Includes: genu valgum (knock knee); genu varum (bowleg); tibial torsion; hammer toe; hallux valgus or varus; any deformity of toe; deformity leg NOS, foot NEC, knee. Excludes X77 and X78.
X77	Flatfoot (including weak or fallen arches and other difficulty with arches).
X78	Clubfoot (congenital).
X79	Deformity, neck, trunk bones, NEC. Includes: pigeon breast; cervical rib; postural defect NEC.
X80	Back, any part. Includes: neck.
X84	Shoulder(s) and/or upper extremity(ies).
X85	Hip and/or pelvis. Excludes: congenital dislocation of hip (X75.9).
X86	Lower extremity. Excludes: impairments involving arches of foot, feet (X77).
X89	Other and ill-defined sites. Includes: rib; trunk, NOS; "side," NOS; joint, NOS; limping; staggering; stumbling; trouble in walking, NOS. Excludes: jaw (X92); and ataxic gait, which if chronic, is coded as for paralysis, partial.
X90	Disfigurement, scarring, face, nose, lips, ears. Includes: absence of nose, lips, ears; accessory auricle; other abnormality NEC of face, nose, ears, mouth, teeth, jaws if stated to be disfiguring. If speech defect is present, code it also. Excludes: cleft palate and harelip whether or not disfiguring (X91.1).
X91	Cleft palate and harelip (with speech defect). (disfiguring). Includes: cleft palate and cleft lip (as in ICD 749) with or without speech defect and whether or not stated to be disfiguring.
X92	Other dentofacial handicap. Includes: acquired absence of teeth, onset 3 months; and abnormalities of teeth, malocclusion, and other jaw and dentofacial anomalies as in ICD 520.0, 520.1, 520.2, 520.5, 521.6, and 524. If speech defect is present, code it also. Excludes: cleft palate and harelip (X91.9) and other dentofacial handicaps if stated to be disfiguring (X90).
X93	Deformity of skull (hydrocephaly) (microcephaly). If mental retardation is present, it is also coded.
X94	Artificial orifice (opening) or valve (surgical) any site (colostomy).
X99	Special impairment, ill-defined. Includes: deformed NOS; cripple NOS; "birth injury" or "brain damage" NOS, at ages 3 months or over without specification as to type of impairment; ill-defined "after effects" of tuberculosis, encephalitis, poliomyelitis, trachoma, toxoplasmosis, other infective and parasitic diseases, rickets, intracranial abscess. Excludes: stroke, or ill-defined "after effects" of stroke.

Note: NOS means "not otherwise specified". NEC means "not elsewhere classified".

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