

Disability Trends in the United States Population 1966–76: Analysis of Reported Causes

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Abstract: According to data published by the United States National Center for Health Statistics, disability reported among the US population has increased substantially during the years 1966 to 1976. Among younger age groups, the increase in activity limitation involves visual and hearing impairments as well as asthma. In the middle age group (45–64), four causes increased in both sexes (diabetes, musculoskeletal disorders, hypertension, and diseases of the circulatory system other than hypertension and heart conditions); one cause affected men only (heart conditions) and one women only (malignant neoplasms). In the 65 and over age group, diabetes and circulatory diseases (excluding heart conditions and hypertension) increased significantly. Although the US population

increased by 10 per cent, the number of persons permanently limited in their activities because of health conditions increased by 37 per cent with a much larger proportion of those disabled claiming to be unable to carry on their main activity. Changes in health survey procedures and changes in standards used by respondents to rate their health status are not believed to account for these findings. Factors which could have contributed to this trend include environmental deterioration and improved social benefits easing retirement and providing better access to the health care system. Planning agencies need to recognize the relationships of the health care system to disability as well as to mortality. (*Am J Public Health* 1981; 71:464–471.)

Introduction

Within a reference framework where mortality is one of the main indicators of health, there is a general feeling of optimism about the impact of the health care system, since overall mortality indices have been improving constantly over the past few decades.¹ However, no one contends that "health" can be assessed in terms of death alone. It is not enough to know that life expectancy is rising or remaining stable; the individual's ability to function must be preserved or, better yet, improved.

It is more difficult to assess functional ability than mortality since the ultimate point in the deterioration of health is easily characterized, while "perfect health" or the World Health Organization's "physical, mental and social well-being" is more utopian than real,² and thus not easily measured. However, on the continuum that stretches from good health to death, the more serious forms of deterioration, in which survival is at stake, are easier to characterize. These types of disability indicators³ in general concern adverse changes in physical mobility, physical independence in the most basic actions, and the ability to carry on one's

usual activities. Most of the operational disability indicators used deal with one or the other of these dimensions^{4–7} or a combination of them.^{8, 9}

In spite of considerable epidemiological work on disability indicators, no country has a complete set of data on the disability of its entire population in the three suggested dimensions over long periods of observation. The best source of information is the continuing United States National Health Interview Survey (NHIS) carried on by the National Center for Health Statistics (NCHS). This survey has systematically gathered information on limitation of activity and physical mobility for over 20 years and thus provides a long-term view of disabilities. It is one of the only sources that can be used in trying to determine whether, in increasing life expectancy, we are also improving the quality of life.

An examination of these data reveals a rather disturbing fact: limitation of activity seems to have increased in recent years. McKinlay points out that life expectancy free of disability did not increase during the 1960s despite a marked growth in life expectancy at birth.¹⁰ In an effort to clarify this question, which is essential to policy making, we intend to re-examine the data and analyze the causes given for limitation of activity and the evolution of those causes from 1966 to 1976, to try to account for these findings.

Material and Methods

Measure of Disability

In the NHIS, activity restriction is the indicator for measuring disability. Sullivan has given a full account of

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TABLE 1—Evolution of Prevalence of Short-Term and Long-Term Disability in the United States between 1966 and 1976

Year	Short-Term (days per 100 inhabitants)		Long-Term (prevalence per 10,000 inhabitants)	
	Bed Disability Days	Other Restricted Activity Days	Main Activity Impossible	Other Limitation
1966	6.3	9.3	213	935
1969	6.1	8.7	286	884
1972	6.5	10.2	295	972
1974	6.7	10.5	334	1079
1976	7.1	11.1	355	1078
Per Cent Variation 1966–76	+ 13	+ 19	+ 67	+ 15

definitions and conceptual problems related to this indicator.^{6, 11} As he suggested, we have taken into account both short-term and long-term disability. In the first case, we have distinguished between bed-disability days and other restricted activity days. Long-term restriction has been divided into four categories according to the victim's ability to carry on the main activity corresponding to his or her age group and occupational status. These categories are:

- Severe: People unable to carry on their main activity
- Moderate: People limited in their main activity
- Slight: People limited not in their main activity but in other activity
- Nil: No limitation of activity

Short-term disability is measured for the entire population in the number of restricted-activity days per 100 people. Long-term disability is expressed in terms of point prevalence: the number of persons whose activity is restricted per 10,000 inhabitants. We examine all the categories of disability,

separating the most severe (those that interfere with the main activity) from the others. Long-term disability among people in institutions has not been considered. They represented 11 per cent of the restricted-activity days in the US in the mid-1960s.¹¹

Time Series and Statistical Significance of Variations in Disability

The data given on disability are those published by the NCHS;¹² they are based on the statistics for the years 1966–1976. Since the changes observed from one year to the next may be due to sampling fluctuations, we used a simple test based on the confidence intervals of percentages observed in each year (1966 and 1976 or 1966 and 1974 for specific conditions tables*) to obtain an appreciation of these random

* NCHS publications on specific causes of limitation of activity are available only for the years 1966 and 1974.

TABLE 2—Variation in the Prevalence* of Limitation of Activity in the United States between 1966 and 1974 by Sex, Age, and Category of Limitation of Activity

Limitation of Activity	<17 Years		17–44 years		45–64 years		65+ years	
	M	F	M	F	M	F	M	F
Severe: Main activity impossible								
Prevalence 1974	25	17	143	67	937	214	2983	816
Variation 1966–74 (%)	+ 32	+ 21	+ 57	+ 76	+ 106	+ 78	+ 38	+ 6
Significance	NS	NS	††	NS	†††	†††	†††	NS
Average: Main activity restricted								
Prevalence 1974	187	150	402	511	1046	1595	1506	2718
Variation 1966–74 (%)	+ 148	+ 118	+ 12	+ 41	– 12	+ 46	– 44	+ 9
Significance	†††	†††	NS	†††	NS	†††	†††	NS
Slight: Other types of restrictions								
Prevalence 1974	188	163	371	278	545	493	485	780
Variation 1966–74 (%)	+ 69	+ 66	+ 51	+ 2	+ 25	– 13	+ 6	– 3
Significance	†††	†††	†††	NS	NS	NS	NS	NS

*Prevalence per 10,000 inhabitants in 1974.

NS: Not significant

††p<.0001

†††p<.00001

variations. For example, as with a classic test, we assumed that the difference in percentages $p_{1966} - p_{1974}$ would not rise above the following value more than once in 1000 events.

$$|p_{1966} - p_{1974}| \leq (3.29) \sqrt{\text{VAR } p_{1966} + \text{VAR } p_{1974}}$$

With : (3.29) -----:Value of the standard normal distribution at 0.001

$|p_{1966} - p_{1974}|$ -----:Absolute value of the difference in percentages

VAR p_{1974} -----:Variance of the percentage observed in 1974

The variances $\text{Var } p_{1974}$ were calculated using the tables provided in each NCHS publication which supply the coefficient of variation "e" (in per cent) given the estimated size "n", as described in Appendix A.

This extremely simple method is also applicable to general prevalence as well as to prevalence by category or by cause of limitation of activity.

We have studied only the causes of long-term limitation of activity. Categories formed on the basis of diagnosis correspond to those published by the NCHS. The relation to the International Classification of Diseases (ICD) can be found in each publication of the NCHS (Series 10: Limitation of Activity due to Chronic Condition). We have compared 1966 and 1974 by creating comparable diagnostic groups. The complete list of diagnostic group studies is indicated in Appendix B. The information on causes in 1976 is taken from the annual report on health in the United States which reviews certain causes being studied.¹³

Results

Variations in the Prevalence of Short-term and Long-term Disability by Type

Raw data on disability (Table 1) points to an increase over the ten-year period in all types: the number of bed-disability days per 100 people rose by 13 per cent, other short-term disability by 15 per cent, and the prevalence of long-term disability rose from 1,148 to 1,433 per 10,000 inhabitants, an increase of 25 per cent. The greatest increase was in the more severe cases of long-term disability, those that make it impossible to carry on one's main activity. From 1966 to 1976, the prevalence rate increased by 67 per cent, from 213 to 355 per 10,000 inhabitants.

Variations in Prevalence by Sex, Age, and Severity of Long-term Disability

Table 2 gives the degree of variation in prevalence between 1966 and 1974 by sex and by age, according to the category of limitation of activity (data for 1976 were not available). For both sexes, the degree of disability was low among young people, but the statistical significance of the difference is nevertheless high since there was a major increase in prevalence. The increase was found in moderate and slight limitations not affecting the ability to carry on main activities. Among adults, however, the incidence of severe limitations rose more steeply than any other type.

The increase was particularly marked in the 45 to 65 age group. In the 65-and-over age group, the prevalence of limitation of activity was very high but there was little change over a 10-year period. Moderate limitation of activity actually decreased for men. Among women, there was no statistically significant variation.

By sex, the prevalence of severe long-term disability was consistently higher among men. Even in the under-17 age group, the prevalence among men was 65 per cent higher than among women, and the difference increased with age; between the ages of 45 and 64, more severe long-term disability was four times higher in men than in women. Only cases of moderate and slight limitation of activity were generally more frequent among women.

Variations by Cause of Long-term Limitation of Activity

Table 3 provides an outline of variations in prevalence of limitation of activity by cause for three age groups (under 45, 45-64, and 65 and over). Only those causes that varied significantly for at least one of the two sexes are shown.

In the under-45 age group, five causes of disability increased noticeably. One affected both sexes: asthma (including hay fever) increased by 99 per cent among men and 76 per cent among women. Two causes appeared to significantly increase only for men: visual and hearing impairments increased by 95 per cent and 155 per cent respectively. Although these rates doubled for women (+ 100 per cent and + 150 per cent respectively) the difference was not significant because rate levels are much lower than male rates. Two other causes affected women only: musculoskeletal disorders (not including arthritis and rheumatism) (+ 111 per cent) and impairments of locomotive system which were aggregated in this analysis (+ 52 per cent).

In the 45-64 age group, six causes of disability seem to have increased significantly, with four affecting both sexes in similar ways: diabetes (men + 151 per cent and women + 144 per cent), musculoskeletal disorders excluding arthritis and rheumatism (men + 89 per cent and women + 156 per cent), hypertension (men + 85 per cent and women + 64 per cent), and diseases of the circulatory system other than hypertension and heart conditions (men + 197 per cent and women + 224 per cent). One affected men in particular: heart conditions (+ 38 per cent); and another affected women in particular: malignant neoplasms (+ 158 per cent).

In the 65-and-over age group, three causes of disability changed significantly between 1966 and 1974, two increasing and one decreasing. There was an increase in limitation of activity for both sexes due to diabetes (men + 127 per cent and women + 104 per cent) and circulatory diseases, excluding heart conditions and hypertension (men + 167 per cent and women + 183 per cent). There was a significant decrease among women in limitation of activity due to mental and nervous conditions (- 46 per cent).

Number of People in US Claiming Limitation of Activity for Specific Causes in 1966 and 1976

In order to appreciate the impact of recent increases in disabilities as an additional burden on the health care system, we have estimated the number of people in the United States

TABLE 3—Variation in Prevalence* of Long-Term Disability between 1966 and 1974 in the United States by Sex, Age, and Type of Pathological Cause Declared

Cause of Limitation of Activity (all categories)	Prevalence per 10,000 Inhabitants	
	Male	Female
A) Age: under 45 years		
Visual impairments		
Prevalence 1974	37	18
Variation 1966–1974 (%)	+95	+100
Significance	‡	NS
Hearing impairments		
Prevalence 1974	28	15
Variation 1966–1974 (%)	+155	+150
Significance	‡‡	NS
Asthma (and hay fever)		
Prevalence 1974	81	71
Variation 1966–1974 (%)	+99	+76
Significance	‡‡‡	‡‡
Musculoskeletal disorders (others: excluding arthritis and rheumatism)		
Prevalence 1974	46	38
Variation 1966–1974 (%)	+53	+111
Significance	NS	‡‡
Impairments of locomotive system		
Prevalence 1974	173	146
Variation 1966–1974 (%)	+8	+52
Significance	NS	‡‡
B) Age: 45–64 years		
Malignant neoplasm		
Prevalence 1974	62	89
Variation 1966–1974 (%)	+104	+158
Significance	NS	‡‡
Diabetes		
Prevalence 1974	136	142
Variation 1966–1974 (%)	+151	+144
Significance	‡‡‡	‡‡‡
Heart conditions		
Prevalence 1974	612	359
Variation 1966–1974 (%)	+38	+21
Significance	‡‡	NS

claiming to be limited in their activities by reason of specific causes in 1966 and 1976 (Table 4).

Despite the fact that overall US population grew by only 10 per cent between 1966 and 1976, the number of persons permanently limited in their activities for health reasons grew by 8 million during the same period to reach 30.2 million in 1976, an increase of 37 per cent. Of the 21.9 million people with limited activities in 1966, 19 per cent claimed to be unable to carry on their main activity; this rose to 25 per cent in 1976, a total of 7.5 million persons compared to 4.1 million persons in 1966.

In 10 years, the importance of disability problems changed considerably. Arthritis and rheumatism took first place as a cause of disability, preceding heart conditions which fell to second place. (These two causes of disability accounted for 33 per cent of cases of limited activity.) Among the other causes, diabetes increased most, moving

TABLE 3—continued

Cause of Limitation of Activity (all categories)	Prevalence per 10,000 Inhabitants	
	Male	Female
Hypertension without heart involvement		
Prevalence 1974	150	271
Variation 1966–1974 (%)	+85	+64
Significance	‡‡	‡‡‡
Other circulatory disorders		
Prevalence 1974	173	157
Variation 1966–1974 (%)	+197	+224
Significance	‡‡‡	‡‡‡
Musculoskeletal disorders (others: excluding arthritis and rheumatism)		
Prevalence 1974	197	182
Variation 1966–1974 (%)	+89	+156
Significance	‡‡	‡‡‡
C) Age: 65 and over		
Mental and nervous conditions		
Prevalence 1974	149	162
Variation 1966–1974 (%)	–33	–46
Significance	NS	‡
Diabetes		
Prevalence 1974	283	334
Variation 1966–1974 (%)	+127	+104
Significance	‡‡	‡‡‡
Other circulatory disorders (not including heart disease and hypertension)		
Prevalence 1974	557	453
Variation 1966–1974 (%)	+167	+183
Significance	‡‡‡	‡‡‡

*Prevalence per 10,000 inhabitants in 1974.

NS: not significant

‡p<.001

‡‡p<.0001

‡‡‡p<.00001

from 7th to 5th place; the number of people claiming disability due to diabetes almost doubled. Visual impairments, hearing impairment, and hypertension (without heart involvement) also rose significantly.

The order of importance of the most severe causes of limitation of activity was less affected. Heart conditions continued to hold first place over arthritis and rheumatism, but a notable change occurred in diabetes and hypertension. Diabetes rose from 6th to 4th place; the number of people whose activities were completely restricted because of this disease more than tripled, while the number of people restricted because of hypertension more than doubled.

Discussion

The increase in disability in the United States and the stability of life expectancy free of disability during the 1960s,

TABLE 4—Evolution between 1966 and 1976 in the United States of the Number of People Claiming to be Limited in Their Activity (Long-Term Disability) Because of Specific Causes.

SELECTED CAUSES	1966		1976		Variation 1966–1976	
	N	rank	N	rank	N	%
Total U.S. population	191,537,000		210,643,000		+ 19,106,000	+ 10
All Categories of Restriction of Activity						
All causes	21,984,000	—	30,175,000	—	+ 8,191,000	+ 37
Heart conditions	3,600,000	1	4,737,000	2	+ 1,137,000	+ 32
Arthritis and rheumatism	3,248,000	2	5,069,000	1	+ 1,821,000	+ 56
Mental and nervous conditions	1,711,000	3	1,479,000	6	– 232,000	– 14
Visual impairments	1,222,000	4	1,629,000	3	+ 407,000	+ 33
Hypertension (without heart involvement)	1,187,000	5	2,082,000	4	+ 907,000	+ 75
Asthma—Hay fever	1,065,000	6	1,448,000	7	+ 383,000	+ 36
Diabetes	562,000	7	1,539,000	5	+ 976,000	+ 174
Hearing impairments	403,000	8	754,000	8	+ 351,000	+ 87
Main Activity Impossible						
All causes	4,078,000	—	7,469,000	—	+ 3,391,000	+ 83
Heart conditions	964,000	1	1,748,000	1	+ 784,000	+ 81
Arthritis and rheumatism	639,000	2	1,307,000	2	+ 668,000	+ 105
Visual impairments	466,000	3	538,000	3	+ 72,000	+ 15
Mental and nervous conditions	400,000	4	523,000	4	+ 123,000	+ 30
Hypertension (without heart involvement)	187,000	5	508,000	6	+ 321,000	+ 172
Diabetes	163,000	6	523,000	4	+ 360,000	+ 221
Asthma—Hay fever	158,000	7	224,000	7	+ 66,000	+ 42
Hearing impairments	126,000	8	142,000	8	+ 16,000	+ 13

noted by McKinlay,¹⁰ seems to hold true for the period from 1966 to 1976. Neither aging of the population nor sampling variability can fully account for these findings.

There is reason to ask whether disability has really increased or whether the basis for this finding is an artificial one. There was a change between 1966 and 1969 in the NCHS procedures and methods of gathering information on limitation of activity that has influenced the rates observed. As a whole, the new method introduced a slight decrease in limitation of activity level, but there was a significant increase in number of persons unable to carry on major activity after 45 years of age. This variation explains the increase observed in 1969 for persons unable to carry on major activity and the drop for persons with other activity limitations in Table 1, but does not explain the recovery noted for the period 1969 to 1976 during which the method of gathering information remained the same. For specific causes it was not possible to restrict considerations to 1969–1976, because data were available only for 1966 and 1974, i.e., before and after methodological change. Nevertheless, on reviewing the comparison of the two methods conducted by the NCHS,^{14, 15} we do not think this change in methodology can explain the total increase observed in specific causes: for all causes, the new method tended to lower the rates of activity limitation when all levels are considered together. By degree of limitation there was a moderate increase in prevalence of severe limitation due, for example, to asthma (+ 13 per cent), heart conditions (+ 26 per cent), and hypertension (+ 9 per cent), but these variations are much lower than those observed between 1966 and 1976 (+ 38 per cent, + 66 per cent, and + 147 per cent, respectively).

It is possible that the discrepancies can be attributed to a change in the answers of respondents not related to their disability status per se but to the standard which they used in referring to their state of health. This standard may have risen over time so that respondents felt more keenly the effects of not being able to carry on certain activities which they had previously thought less important. Such a change in outlook cannot be overlooked, particularly for cases where the limitation of activity involved not only the *principal* activity but *any* activity. However, this argument cannot easily explain the variation in the rate for limitation of the main activity and even less the variation observed in the rate of bed-disability days. Among the 8 million additional people stating that they were limited in their activities, some may have been more worried, more anxious, or more demanding than seriously disabled, but this explanation cannot cover the 3 million additional people who claimed to be unable to carry on their main activity, particularly in the under-17 age group; nor can it explain activity limitation from causes as clear-cut as visual or hearing problems.

The increase noted between 1966 and 1976 seems recent since Sullivan noted a slight decrease in both long-term and short-term disability between 1959 and 1965–66.⁶ His study dealt only with the most severe cases of limitation but these were the very cases that increased the most, particularly among male adults. In the most recent publications covering the year 1978,¹² there was a slight drop compared to 1976 in cases of short-term disability, particularly among women, and a stabilization of long-term disability for all age groups except the under-17 group where the prevalence continued to rise. These variations cannot be evaluated at this time,

and only time will tell whether we are dealing with a chance occurrence or a new phenomenon in health. In any case, in no way do these figures suggest that the state of health of the population in general is steadily improving.

It is possible to discount the significance of these data if one believes that what is called "health" cannot be measured by an essentially subjective indicator such as limitation of activity. In that case, only the application of screening techniques followed by diagnostic examinations could provide the necessary objective measurements.

We do not hold this point of view since we believe that health is essentially a concept related to a social group.¹⁶ "Laboratory conditions" required for medical examinations make it possible to determine with much greater certainty the presence or absence of problems described in diagnostic terms, but contribute little to evaluate the behavior of subjects in their usual life-style and their real physical and social environment. This last evaluation is the only way, in our opinion, of approaching the health status issue unless health is reduced to the simple absence of disease. It is possible, of course, to discuss the relevance of the limitation of activity indicator within the framework we have described. It is certainly not the perfect indicator since limitations that do not affect the main activity are not well enough defined and are too dependent upon statements that cannot easily be reproduced. It may also be difficult to interpret "main activity" for certain categories of the population such as women at home and the unemployed; these difficulties alone may explain certain discrepancies—those observed between the sexes for instance. Yet, this measure seems very close to the concept of health even if other aspects of disability (mobility, physical independence) must be added in order to improve the overall picture.

If we accept the premise that limitation of activity is a component of health, the increase in its prevalence may be interpreted in two ways:

- as the result of an increase in the incidence of certain disorders with which the health care system is unable to deal, despite greater access to health services; or
- as the consequence of an increase in the use of the health care system which results, in part, from the increased availability of social programs.

To establish the first hypothesis, we would endeavor to identify what kind of deterioration in the physical or social environment could have caused an increase in the incidence of certain pathological disorders and their effects (limitation of activity). For example, the increase in cases of limitation of activity due to asthmatic ailments could suggest an increasing atmospheric pollution; however, recent publications^{16, 17} fail to back up such an assumption. Deterioration in the physical environment could also be considered to account for the increase in cases of limited activity due to cancer, although the exact nature of the change is not obvious. The possible health consequences of deterioration in the social environment are extremely difficult to identify and measure. Such consequences may lead to disorders of a psychological or physical nature, e.g., an increase in cases of limited activity due to hypertension is known to be affected by stress.

If one holds to the first hypothesis, one must be concerned about the inefficacy of the health care system, since access to health services improved in the United States over the period under study and an increasingly large portion of the Gross National Product was earmarked for the health sector.

The second hypothesis, which does not necessarily exclude the first, ascribes the findings to an increase in the use of the health care system resulting in a higher rate of declared cases of limited activity. During the period studied, Medicare and Medicaid came into being, and disability retirement benefits became more generous, allowing workers to retire at an earlier age because of health problems. If these changes led to easier access to health care, the lesson is clear: utilization of the health care system cannot be indiscriminately increased without consequences reflecting deterioration rather than improvement in health status. An additional factor that could influence change in the same direction is that social programs allow people to stay out of institutions; the trend to keep handicapped children at home rather than in institutions could partially explain the increase.

In other cases, it is possible that greater use of the health system, and therefore better care, affected the course of certain disorders favorably, causing mortality to drop but leaving disabled survivors, thus accounting for the greater prevalence of limited activity. This situation may hold for coronary heart disease. It is not known whether there is a connection between the drop in the mortality rate for these disorders and the health care system, but it has been noted that mortality rates by age group over 15 have fallen off noticeably, and recovery from myocardial infarction can result in limitation of activity. The same is doubtless true of diabetes although the case is not as straightforward. The survival of insulin-dependent diabetics obviously reduces the mortality rate and results in delayed disability due to degenerative processes which do not respond to therapy. This may or may not be true for the many adult non-insulin dependent diabetics. A favorable effect of therapy on the mortality rate of borderline cases has not been proven.¹⁸ On the other hand, the increase in cases of limited activity cannot be due only to insulin-dependent diabetics; the overall picture remains uncertain.

The mortality rates for malignant neoplasms have improved for the under-45 age group but have risen slightly for the higher age brackets. The increase in disability due to malignant tumors is seen mainly among women over age 45. Surgery (breast, uterus) probably accounts for this increase to some extent, but here again it is difficult to evaluate the overall improvement.

The increase of limitation of activity caused by hypertension is surprising. If it is a reflection of increased screening leading to diagnosis and treatment, hence improved survival, we must account for the fact that the better informed people are, the more limitations they declare. While it seems obvious that greater use of the medical system leads to an increase in prevalence of diagnosed disorders, it is difficult to see why cases of limitation of activity also result because the objective of screening tests is

to detect disease before any trouble appears. Perhaps this is an example of what Illich calls social iatrogenesis.¹⁹

For the younger age group, the situation is more perplexing. Medicare and Medicaid programs are less important as an explanation of the rise of long-term disability because of the improvement in social protection. Furthermore, Wilson and White²⁰ found that between 1964 and 1973 the greatest increase in cases of long-term disability in this age group was among non-poor Whites (+ 60 per cent) as opposed to only + 41 per cent among poor nonwhites and + 27 per cent among poor Whites. In addition, there was an increase in the number of cases of limited activity due to such specific causes as visual or hearing defects, both of which more than doubled in 10 years. An increase in accidents, and improved survival of very low birthweight infants^{21, 22} are among the factors to be considered as well as the health care system itself. In any case, the size of the increase in limitation of activity in such a short period of time among younger persons is cause for concern.

Conclusion

This examination of American disability data over the past decade contradicts the belief in a steady, clear-cut improvement in health status despite arguments to the contrary based on life expectancy. Even though a great many factors may have contributed to the increase in the number of declared cases of activity limitation in the American population, and even though we cannot gratuitously dismiss as unimportant the attitude of the American people or the influence of the health care system, the situation merits thought and consideration: it may serve to explain the continuous increase in demand for medical care, although in actuality the two phenomena may be interdependent.

Quebec, like many government agencies concerned with health planning, has never considered anything but mortality statistics. Nevertheless, it is quite possible that the work of the health care system is more closely related to disability than to mortality, as evidenced by the difficulty experienced in establishing a satisfactory correlation between mortality and the structure of the health care system.²³

The systematic introduction of this aspect in the planning process, as it is projected in Quebec, would have at least three effects:

1. It would make incapacitating chronic illness (osteoarticular and neurological diseases) among the first priorities, which they are not at present.

2. It would refine policy objectives, which would then consist not only in lowering mortality but in improving the ability to function, which does not seem always to follow mortality reduction.

3. It would increase public awareness of the price that must sometimes be paid in disability in order to improve the mortality rate and vice versa; more specifically, it would reinforce efforts to see that certain technological innovations, in both diagnosis and therapy, do not give rise to more harmful consequences than real advantages, particularly when the expected advantage itself is not obtained.

REFERENCES

1. National Center for Health Statistics (NCHS): Vital statistics Report, Final Mortality Statistics, 1977. U.S. DHEW Pub. No. (PHS) 79-1120, Vol. 28, No. 1 Supplement May 11, 1979.
2. Dubos R: *Mirage of Health, Utopia, Progress and Biological Change*. New York: Harper and Brothers, 1961.
3. Wood PHN, Badley EM: An epidemiological appraisal of disablement. IN: Bennet AE (ed): *Recent Advances in Community Medicine*. Edinburgh: Churchill Livingstone, 1978.
4. Harris AI, Cox E, Smith CR: *Handicapped and impaired in Great Britain. Part I*. HMSO London: Office of Population Censuses and Surveys, 1971.
5. Isaacs B, Neville Y: The needs of old people: "The interval" as a method of measurement. *Brit J Prev Soc Med* 1976; 30:79-85.
6. Sullivan F: Disability components for an index of health. USDHEW, NCHS, Series 2, No 42, 1971.
7. Ableson J: The measurement of disability in the Canada Health Survey. Working paper series #77-2 prepared for presentation at the third meeting of OECD Social indicators program, Ottawa June 1977. Department of National Health and Welfare and Statistics Canada, Ottawa, 1977.
8. Fanshel S: A meaningful measure of health for epidemiology. *Int J Epid* 1972; 1:319-337.
9. Rosser RM, Watts VC: The measurement of hospital output. *Int J Epid* 1972; 1:361-367.
10. McKinlay SM, McKinlay JB: Examining trends in the nation's health. Presented at the American Public Health Association 107th Annual Meeting New York City, Nov. 1979.
11. Sullivan F: Conceptual problems in developing an index of health. USDHEW, NCHS Series 2, NO. 17, 1966.
12. National Center for Health Statistics (NCHS): Data from the National Health Interview Survey. Series 10, from 1966 to 1978—see details in Appendix "C".
13. USDHEW: Health—United States: DHEW Pub. No. (PHS) 78-1232, Dec. 1978.
14. National Center for Health Statistics (NCHS): National Health Interview Survey Procedures 1957-1974, DHEW Pub. No. (HRA) 75-1311, Series 1, No. 11, Apr. 1975.
15. National Center for Health Statistics (NCHS): Interviewing Methods in the National Health Interview Survey: DHEW Pub. No. (HSM)-72-1048, Series 2, No. 48 Apr. 1972.
16. Kelman S: The social nature of definition problem in Health. *Int J Health Serv* 1975; 5:625-642.
17. U.S. Department of Health, Education, and Welfare: Health—United States 1979. DHEW Pub. No. (PHS) 80-1232, 1980.
18. Kolata GB: Controversy over study of diabetes drugs continue for nearly a decade. *Science* 1979; 203:986-990.
19. Illich I: *Medical Nemesis—The Expropriation of Health*. Calder and Boyars (eds): London: Pantheon, 1975.
20. Wilson RW, White EL: Changes in morbidity, disability and utilization; differentials between the poor and the non-poor. Data from the National Health Survey: 1964 and 1973. *Med Care* 1977; 15:636-646.
21. Davies PA, Stewart AL: Low-birth-weight infants: Neurological sequelae and later intelligence. *Brit Med Bull* 1975; 31:85-91.
22. Hack M, Fanaroff AA, Merkatz I: The low-birth-weight infant—Evolution of changing outlook. *N Engl J Med* 1979; 301:1162-1165.
23. Cochrane AL, Leger AS, Moore F: Health service "input" and mortality "output" in developed countries. *J Epid and Comm Health* 1978; 32:200-205.

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APPENDIX A

Statistical Method Used to Test Significance of Time Variations in Prevalence of Long-Term Disability

The table provided in each NCHS publication gives the relative standard error "e" for each estimated number of people "n".

Knowing that the proportion (p) of people with limitation of activity is $p = n/\tau$ (τ = total population in the United States for the age group under study), the test consists in calculating:

$$U = \frac{\frac{n_1}{\tau_1} - \frac{n_2}{\tau_2}}{\sqrt{\left(\frac{n_1}{\tau_1} e_1\right)^2 + \left(\frac{n_2}{\tau_2} e_2\right)^2}}$$

and comparing "U" with the value given by the standard normal distribution. The value of the standard normal distribution at 0.001 is 3.29, so:

- If $U \leq 3.29$, the null hypothesis is accepted. No variation in the years studied.
- If $U > 3.29$, the null hypothesis is rejected and it is supposed that there was a temporary variation in prevalence; the value of U gives the degree of significance.

Appendix B

List of Diagnostic Groups Studied

- Tuberculosis all forms
- Benign and unspecified neoplasms
- Malignant neoplasms
- Diabetes
- Mental and nervous conditions
- Heart conditions
- Hypertension without heart involvement
- Other conditions of circulatory system *including*: cerebrovascular diseases, varicose veins, hemorrhoids, others
- Asthma (including hay fever)

- Other respiratory conditions *including*: chronic bronchitis, emphysema, chronic sinusitis, others
- Digestive conditions *including*: peptic ulcer, hernia, others
- Conditions of genitourinary system *including*: diseases of kidney and ureter
- Arthritis and rheumatisms
- Other musculoskeletal disorders
- Visual impairments
- Hearing impairments
- Impairments of locomotive system *including*: paralysis complete or partial, impairment (except paralysis of back or spine), impairment (except paralysis) of upper extremities and shoulder, impairment (except paralysis and absence) of lower extremities and hips

APPENDIX C

Year	Type of Disability		
	Short-Term	Long-Term Limitation of Activity	
	Disability Days	All Causes	By Causes
1966	43	61	61
1969	63	80	—
1972	85	96	—
1974	100	111	111
1976	119	119	see ref.(13)
1978	130	130	—

Source of data: Series 10, Vital and Health Statistics publication numbers according to year and type of disability, U.S. National Health Interview Survey.

ERRATUM

IN: Itoh M, Tierno PM Jr, Milstoc M, Berger AR: A unique outbreak of *Pasteurella multocida* in a chronic disease hospital. Am J Public Health 1980; 70:1170. We omitted the primary affiliation of Dr. Berger, one of the authors. Dr. Berger is Professor of Clinical Medicine, and Director of Medicine, New York University Medical Center, Goldwater Memorial Hospital, New York City. We apologize to Dr. Berger and our readers for this omission.