PHYSICAL IMPAIRMENTS AND SOCIO-ENVIRONMENTAL FACTORS

ROLLO H. BRITTEN

AS stressed in the past and in the discussions today, the measurement of health or of disability may be thought of in terms of three major approaches: mortality statistics, records of sickness, and assessment of physical status by medical examination. Thus the establishment of interrelations between health and socio-environmental factors must involve these three approaches. Hence the separation of subject matter under which I am to discuss physical impairments in relation to these factors.

There is a major overlap, however, between mortality and morbidity records on the one hand and physical examinations on the other. Chronic diseases in their more severe stages cause morbidity and ultimately death; yet they are often ascertainable on physical examination; and, in fact, their discovery is often the primary purpose of such examination. Conversely, the most usable data on incapacitating physical impairments have come from morbidity studies, such as the National Health Survey.

In view of the need for some line of demarcation, I have limited myself to that type of condition which is *normally* thought of as physical impairment (impaired vision, impaired hearing, orthopedic impairments, teeth defects, and a few conditions bordering on chronic disease, such as hernia, varicose veins, arterial thickening, valvular heart lesions); but, for data, I will rely on morbidity surveys as well as on medical examinations. The above types of impairments carry a precise meaning, with the possible exception of orthopedic impairments. By this type is meant permanent handicaps which deprive a person of the natural use of some portion of the skeletal system—or more simply, lost, crippled, paralyzed, or deformed parts of the body.

The material to be referred to has been limited essentially to

two sources: the National Survey and a special study of Physical Impairments of Adult Life. In the National Health Survey (1), particular inquiry was made as to the presence of blindness, deafness, and orthopedic impairments (described on the schedule as (a) loss of leg, arm, fingers, etc.; and (b) crippled, deformed, paralyzed). Information was asked as to parts of the body affected, cause, and appliances used. Whether or not the impairment was incapacitating was also determined. For the present purpose, the main value of these data lie in the record of *incapacitating* impairments in relation to employment status and family income. In the survey, a group of the population was identified as "unemployable," the schedule question being whether the person, if not employed or not seeking work, was prevented from doing so by physical or mental impairment. Discussions relative to this group are limited to the ages 15–64 years. Persons in institutions for the entire twelve months preceding the survey were excluded.

As a matter of fact, the institutionalized population was lost to a large extent from data based on the National Health Survey and entirely from those obtained in the special study of Physical Impairments of Adult Life. Nonetheless, the group is of vast importance as representing an extremely severe stage of disability, whether by disease or by impairment. Although it is hardly possible to assess the economic status of these persons separated from their families and sustained in large part at public expense, they would certainly be classified as still further removed from ability to earn a living than the "unemployable" group of the National Health Survey.

It is fitting that the second source of material to be discussed should be that analyzed for the Milbank Memorial Fund under Mr. Sydenstricker's direction, namely, the records of adult males given "health examinations" by the Life Extension Institute. Following a preliminary study by another speaker on this program (Dr. Dublin) (2), Mr. Sydenstricker undertook these studies to supplement mortality and morbidity data as measures of the health status of the population. There resulted

a series of papers which introduced this new concept of measuring health (3). One of these dealt specifically with physical examinations and occupational class. Following similar comparisons in England based on mortality statistics, occupational class was used directly as a measure of economic or social status.

The examinations forming the basis of these studies were a sample of those made by the Life Extension Institute for policy-holders as a part of the welfare program of insurance companies. (They were not, it is to be emphasized, examinations made to determine whether a person was eligible for insurance.) Hence the studies describe a group of people all of whom were able to be about. The material covered first (as differentiated from later) medical examinations of one hundred thousand native-white male policy-holders in forty life insurance companies by nine thousand physicians. The examinations were divided into two groups—those made in the "head" offices, primarily New York, and those made in the "field." For numerous reasons (larger numbers, a better distribution by occupational class, a wider concensus of medical judgement, if less thorough examinations), the data here discussed are confined to examinations made in the "field."

Occupations were classified into four groups, having from 14,000 to 50,000 examinations each, except the small agricultural group of 4,500. Such groupings were used, of course, in the absence of specific knowledge as to the income of the persons examined. There is a recognized bias in the data in the direction of higher than average economic status. To a large extent this bias has been overcome by treating these occupational classes separately; but within any one class there is a tendency for the figures to represent the relatively better off individuals; and furthermore, no group of unskilled workers could be isolated. Thus the range in economic level is less than that which would be found in the general population.

From an economic point of view, the two studies (Life Extension Institute examinations and the National Health Sur-

vey) were carried out in two very different periods. The former data were collected in the so-called prosperous 1920's; the latter was a by-product of the following depression. If one were establishing quantitative relations in the sense that the physicist or chemist thinks of them, the differing background of the two studies would be a serious drawback; but a major point is to be made that the comparisons are really not quantitative in that sense. The degree of the relation depends on the extent to which we isolate persons at one end of the economic scale; as we do so, however, the smaller becomes the group we are considering. There is a balance then between the proportion of people affected and the sharpness of the comparison.

An important statistical fact, which bears on the above point, is the relative frequency of impairments of differing degrees of severity. The less severe cases are greatly in the majority and hence, unless specifically excluded, they dominate any rate. Thus where impairments are counted regardless of severity, it is difficult fully to assess the association with economic status. Indeed, I find a certain unreality in speaking in terms of the frequency of impairments in the population (for instance, the number of persons with hernia or with arteriosclerosis); and when such rates are quoted in this discussion, it must be understood that the only purpose is to indicate relative differences in frequency between socio-economic groups.

I have endeavored to minimize these difficulties by showing for each a very severe degree, as well as some broader prevalence rates—blindness and impaired vision; deafness and impaired hearing; incapacitating and non-incapacitating orthopedic impairments. Also the emphasis will not be on the exact percentage differences, but on the fact that correlations do exist.

The two studies forming the basis of this talk do not employ the same index of economic status. Annual family income (obtained in broad groups and for other reasons not a precise measure of the real economic position of the individuals), em-

ployment status, color, and occupational class are used as rough measures of the same thing. Crowding or some other index of environmental factors could have been used. These criteria all point in the same direction and serve well our non-quantitative purposes.

This discussion being exploratory and suggestive of further research, there will be no attempt to burden you with references to other sources of data (4), but it is to be regretted that no clear-cut illustrations are available from our most ambitious program of medical examinations—the selective service and induction examinations. No analyses have been made, so far as I know, which will permit any adequate economic comparisons. About all that can be said at present is that the draft results (5) are not inconsistent with the indications of the Physical Impairments of Adult Life study.

It is a truism to say that incapacitating physical impairments result in a lowered economic status. A permanently disabled person cannot usually earn a living. Not only is his economic well-being affected, but so is that of other persons in his family, if any. Even though he would not have been a wage-earner if without an incapacitating impairment, it is manifest that an economic loss exists because of other activities, such as housekeeping, in which he (or she) cannot engage, and also because of the serious drain of invalid care. The tragic effect of physical impairments on the economic position of countless numbers of families is one which cannot be put into words, much less into statistics. Society has recognized this fact in increasing degree, as evidenced by Workmen's Compensation laws and then by Social Security programs for the blind and for crippled children.

The other side of the shield is the problem of physical impairment as a result of certain components of low economic status. This relation is not so simple, and the statistics are ambiguous. It is necessary to rely on other types of information, such as the known effect of malnutrition.

The defect of blindness is a good point of departure for a review of the association of physical impairments and socio-

environmental status because its incapacitating effect is so clearly recognized. Every one has come into contact personally with individuals who were blind in both eyes, and knows the terrible economic consequences involved. Seventy per cent of men, blind in both eyes, under 65 years of age, were classified as "unemployable" in the National Health Survey. To express the point from another angle, 3 per cent of persons classified as "unemployable" in the Survey were blind in one or both eyes. Most of the blind persons who were classified as employed could earn a living only in restricted ways, with varying degrees of help.

Although it would be expected that blindness in both eyes would manifest a sharp relation with economic status (and such was the case), it is interesting that blindness in one eye only showed a similar correlation of about the same degree. In both instances the rates in the group with annual family income under $1,000 were about four times those for the income group of $5,000 and over. There was a marked excess in the rates of the colored population over those in the white. In the South the rate per 100,000 for blindness in both eyes was 217 against 74; in the Northeast, 152 against 70; in the North Central, 207 against 81.

No categorical answer can be given as to the extent blindness appears as a cause of low economic status or as a result of it. The reaction goes both ways, and it is of most significance that, whether or not the blindness is associated in its origin with factors involving economic or environmental level, it acts as a deteriorating influence on such level. National Health Survey data gave some indications of the relative part disease and accident play in blindness. Much of this information is of value in pursuing this point, but time prevents giving the figures.

The proportion of persons with defective vision—we turn now to the study of Physical Impairments of Adult Life—was highest in the professional and business groups. Since less than normal in either eye by either the Snellen or Jaeger tests was

the criterion used, slight defects of vision naturally dominate the figures, and the picture is radically different from that for the extremely severe stage of blindness. The percentages (56 for professional; 51 for business; 43 for skilled trade; and 36 for agriculture) may indicate elements of selection or some effect of excessive use of the eyes.

Total or serious deafness bears a relation to economic status in the data of the National Health Survey, though during the productive ages the frequency is low. In the Physical Impairments of Adult Life study, defective hearing had considerably higher rates in the skilled trade group than in the relatively better off occupational classes. Rates in certain specific occupations suggested an occupational hazard.

Orthopedic impairments in particular have a serious effect on employment and income status. Only a few summary statements are needed on this point. Twenty-three per cent—nearly a quarter—of the "unemployable" persons in the National Health Survey were so classified by reason of orthopedic impairments. Accordingly, we would expect—and we find—that there was a marked relation between the prevalence of incapacitating orthopedic impairments and family income. For males the prevalence rate per 1,000 persons was 5.2 in the annual family income group of less than $1,000, as against 1.3 for incomes of $2,000 and more; for females the corresponding rates were 2.4 and 1.4. A similar relation was noted for non-incapacitating orthopedic impairments.

Since orthopedic impairments can hardly be thought of as a single entity, the make-up of the group should be described in general terms. Of the total prevalence rate of 19 per 1,000 persons, 7 per 1,000 were cases of lost members and 12 of impaired members. In both groups the persons with non-incapacitating impairments were in the majority, and the degree of this excess was naturally dependent on the thoroughness of coverage of the lesser impairments. As in the case of blindness, data were available on the relative proportion due to disease and to accident, and the causes in each of these groups. For the "un-

employables," the cause of the impairment was reported as "accident" in 47 per cent.

A critically important part of a person's environment from a health point of view is his housing, and has been so recognized by the Milbank Memorial Fund in its support of the Hygiene of Housing Committee of the American Public Health Association. As a matter of fact, that Committee is meeting with this Conference. It is not far-fetched to include under this discussion of orthopedic impairments, certain aspects of housing and health. Dilapidated structures offer an increased risk of accidents. In fact, the National Health Survey indicates that the rate of serious accidents (those disabling for a week or more) is higher as the rental goes down. In this survey data were available also as to the prevalence of orthopedic impairments resulting from home accidents. Even more important is the tendency for families with members having incapacitating impairments, whatever the cause, to slip down the economic scale and therefore into that type of housing where adequate care is difficult to provide.

Since the question of needs for further studies has been raised, I should like to mention the great enthusiasm with which persons in the housing field welcome any information on the effect of housing on health. A joint committee of the American Public Health Association and the National Association of Housing Officials, of which Mr. Bleecker Marquette is chairman, has outlined in detail the problems of studying these relations and is interested in the further development of techniques. If any group should project studies of health and environment, the work of this committee should be considered.

Although in this discussion occupational class has been employed as an index of socio-environmental level, it is clear that the data are based on rates in specific occupations and may therefore reflect specific hazards. Of course, a major factor in the environment is the occupation. As this subject receives special attention later in the program, it is desired only to call attention to the fact that accidents result in permanent impair-

ments as well as sickness or death. Indeed, the National Health Survey data on orthopedic impairments showed that among males 24 per cent of the incapacitating cases were occupational in origin, and 45 per cent of the non-incapacitating cases. The percentage was 12 for blindness in both eyes and 24 for blindness in one eye only. In view of this fact, it is of importance to bring out, with respect to their bearing on physical impairment, the problems of control of accidents in industry, and such related aspects as child labor laws, employment of women in industry, etc.

The lack of medical, nursing, and dental care is a contributory factor in the prevalence of physical impairment, and of course closely associated with other environmental factors, particularly low income. Teeth defects may be chosen as an example of the point. These defects, whatever other factors are involved, are obviously in many cases aggravated by neglect of dental care. In fact, it is entirely clear that high rates of prevalence in the low economic groups is a reflection of this fact. In the Physical Impairments of Adult Life study, excessive rates of carious teeth (including septic roots) and for pyorrhea were found in the skilled trade and agricultural groups, as against the business and professional. The percentages for carious teeth were, respectively, 17, 18, 12, and 10. For pyorrhea the four corresponding percentages were 10, 7, 5, and 4. Had this study included a group of the lowest economic class, the contrast would have been much greater.

Although the National Health Survey did not obtain a record of the prevalence of teeth defects, a supplementary study on dental care was made in Detroit and will serve to bear out the relation between prevalence of defects and amount of care. It was found that 42 per cent of professional persons had received dental care in one year (exclusive of extractions only), whereas for unskilled workers the percentage was 16. Of the professional persons, only 4.4 per cent reported that they had never been to a dentist, as against 16 per cent for unskilled workers.

The relation of a few other impairments to socio-environmental status should be mentioned. In the Health Survey, hernia showed perhaps a sharper relation to economic status than any other condition, including disease. The annual rate of disability in the group with annual family income of less than $1,000 was nine times that in the group with income of $3,000 or more. For varicose veins the ratio was 5 to 1. The study of Physical Impairments of Adult Life offers information on certain other conditions. Among those with definitely higher rates in the skilled trade group as against the business and professional were those for valvular heart lesions, enlarged heart, and arterial thickening.

I am always disquieted at presenting statistical facts which blunt the mind by reason of their abstract quality, which usually minimize disparities because they neglect quality, and which seem such a pale expression of the tragedies that lie behind them. It is easy to show that the blind are mostly unemployable; families are lowered in economic scale by reason of orthopedic impairments; many people do not receive adequate medical and dental care; the ratio of difference in prevalence by economic status can run as high as 9 to 1. But it will take imagination and understanding to get at the discouragement and despair behind these facts.

In spite of the ambiguous nature of available data on the association of physical impairments and socio-environmental factors, the following facts stand out:

1. Serious impairments result in lower economic status.
2. This relation is true even for impairments in a group of people able to be about.
3. To an important extent, the components of low economic status are causes of physical impairments, forming a vicious circle.
4. Certain elements in the environment are particularly significant in this connection, such as occupation, housing, nutrition, and insufficient medical care.

I feel deeply that every human being has certain inalienable

rights of opportunity which the present economic and racial disparities completely take away from many. It is to be doubted whether dealing only with symptoms will make adequate restitution. So I believe that social medicine must consider also the basic social, economic, and racial inequalities. This need is particularly important at a time when forces of incalculable power in this country are being brought to bear, for profit, against the rights of people and being supported overwhelmingly by the press. The standard of living of the mass of people is steadily deteriorating—even in a period of so-called prosperity—and the profits of a limited group are rising. And there is the threat of a depression. Meantime, abetted by these very forces, there is an ominously growing hysteria that can conceivably bring fascism to this country and perhaps even a war which will destroy everything for which we are working. International cooperation must be reestablished.

References

1. Perrott, George St. J.; Tibbitts, Clark; and Britten, Rollo H.: The National Health Survey: Scope and Method of the Nation-Wide Canvass of Sickness in Relation to its Social and Economic Setting. *United States Public Health Reports,* 54, September 15, 1939, pp. 1663–1687. Reprint No. 2098.

Britten, Rollo H.; Collins, Selwyn D.; and Fitzgerald, James S.: The National Health Survey: Some General Findings as to Disease, Accidents, and Impairments in Urban Areas. *United States Public Health Reports,* 55, March 15, 1940, pp. 444–470. Reprint No. 2143.

Britten, Rollo H.: A Study of Dental Care in Detroit, Michigan. *United States Public Health Reports,* 53, March 25, 1938, pp. 446–459. Reprints No. 1919.

Britten, Rollo H.: Blindness, as Recorded in the National Health Survey: Amount, Causes and Relation to Certain Social Factors. *United States Public Health Reports,* 56, November 14, 1941, pp. 2191–2215. Reprint No. 2332.

Britten, Rollo H. and Altman, Isidore: The National Health Survey: Illness and Accidents Among Persons Living Under Different Housing Conditions. *United States Public Health Reports,* 56, March 28, 1941, pp. 609–640. Reprint No. 2253.

Karpinos, Bernard D.: The Physically Handicapped. *United States Public Health Reports,* 58, October 22, 1943, pp. 1573–1592. Reprint No. 2521. Also unpublished data.

2. Dublin, Louis I.; Fisk, Eugene Lyman; and Kops, Edwin W.: Physical Defects as Revealed by Periodic Health Examinations. *American Journal of Medical Sciences,* 170, October, 1925, p. 576.

3. Sydenstricker, Edgar and Britten, Rollo H.: The Physical Impairments of Adult Life. General Results of a Statistical Study of Medical Examinations by the Life Extension Institute of 100,924 White Male Life Insurance Policy Holders Since 1921. *American Journal of Hygiene,* xi, January, 1930, pp. 73–135.

Sydenstricker, Edgar and Britten, Rollo H.: Physical Impairments and Occupational Class. Differential Rates Based Upon Medical Examinations of 100,924 Native-Born Adult White Insured Males. *United States Public Health Reports,* xlv, No. 34, August 22, 1930. Reprint No. 1404.

Britten, Rollo H. and Goddard, Jennie C.: Rates of Physical Impairements in 28 Occupations, Based on 17,294 Medical Examinations, *United States Public Reports,* 47, No. 1. January 1, 1932.

Britten, Rollo H. and Goddard, Jennie C.: A New Measure of the People's Health: A Critical Summary of Medical Examination Records. Milbank Memorial Fund *Quarterly Bulletin,* x, July, 1932, pp. 223–246.

4. Grover, Mary and Yaukey, Jesse B.: Physical Impairments of Members of Low-Income Families: 11,490 Persons in 2,477 Farm Security Administration Borrower Families, 1940. I. Characteristics of the Examined Population. II. Defective Vision as Determined by the Snellen Test and Other Chronic Eye Conditions. *United States Public Health Reports,* 59, September 8, 1944, pp. 1163–1184. Reprint No. 2576.

———III. Impaired Hearing for Speech. *United States Public Health Reports,* 60, April 20, 1945, pp. 429–441. Reprint No. 2617.

———IV. Defective Tonsils and Adenoids. *United States Public Health Reports,* 60, June 22, 1945, pp. 693–710. Reprint No. 2633.

———V. Defects of the Nasal Septum; and Chronic Respiratory Affections, Exclusive of Diseased Tonsils. *United States Public Health Reports,* 60, April 14, 1945, pp. 1069–1085. Reprint No. 2654.

———VI. Extent of Immunization Against Smallpox, Diphtheria, and Typhoid Fever. *United States Public Health Reports,* 61, January 25, 1946, pp. 97–109. Reprint No. 2690.

The Health Status of NYA Youth. A Nation-Wide Survey of Youth on the Out-of-School Work Programs of the National Youth Administration. Government Printing Office, Federal Security Agency. 1942.

5. Physical Examinations of Selective Service Registrants. Analysis of Reports of Physical Examination; Summary of Data From 19,923 Reports of Physical Examination. *Medical Statistics Bulletin No. 1,* Selective Service System.

Causes of Rejection and Incidence of Defects: Local Board Examinations of Selective Service Registrants in Peacetime. *Medical Statistics Bulletin No. 2.*

Physical Examinations of Selective Service Registrants During Wartime. *Medical Statistics Bulletin No. 3.*

Physical Examinations of Selective Service Registrants in the Final Months of the War. *Medical Statistics Bulletin No. 4.*