

# Diabetes and Work

## A Study of the Place of Diabetics in the Labor Pattern

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Physicians caring for diabetics are faced with the problem of their capacity for work. The attitude that diabetes can incapacitate the individual for some kinds of work and often leads to physical disability is not unusual. This implies that the sickness absence of diabetics would be greater than that of nondiabetics. There is, however, little concrete information on this aspect of the subject. The literature contains only a few publications, most of them American,<sup>1-5</sup> dealing with the employment of the diabetic. The majority concentrate on special conditions of such employment, and a few illustrate the experience of companies with diabetic employees. In investigations of the latter type, results indicating that the work record of diabetics is satisfactory though in some cases slightly less favorable than that of nondiabetics were obtained by Brandaleone<sup>3</sup> (in a New York City bus company), Dublin and Marks<sup>5</sup> (in the New York City home office of the Metropolitan Life Insurance Company), MacConachy<sup>5</sup> (in the Philadelphia Electric Company), and by the U.S. Bureau of Labor Statistics<sup>10</sup> via a questionnaire sent to forty-five companies. The findings of these studies, however, pertain to a small number of diabetics.

In making any study of patients at work, either the disease or the work can serve as orientation factors. The former approach is simplified by the availability of the data collected by the attending physicians. Although this approach supplies a great deal of information concerning the nature of the work done by the diabetics, their education, and the problems they encounter in their work, it has the decisive drawback that these patients are scattered over such a large number of industries and companies that collecting a comparable control group without the disease but with the same working conditions is almost impossible.

Such difficulties can be avoided by taking the work as the starting point of the investigation and making up groups within comparable employment conditions. The diabetics can be located in concerns with available data on work and health, and these will be companies

in which an occupational health service takes part in deciding the placement of employees and collects information about the state of health and incapacity for work of sick employees. Because in The Netherlands only the minority of the employed workers receive such care, it was impossible to reach the entire group of working diabetics, which in turn made it impossible to investigate a random sample of diabetics.

An evaluation of the place of the diabetic in the labor pattern must distinguish between those still to be employed and those who already have jobs, since the attitude toward a diabetic applying for work in a company differs from that toward a diabetic already employed. Two factors in the latter case are responsible for this difference: Firstly, a valuable employee already adjusted to the requirements of the job may be fitted into or kept in a type of work for which a diabetic applicant would not be chosen, and secondly, where the education and experience of an employee who has been with the company for some time exclude him from any other available position in the company, he may be kept as long as possible in his original job.

### METHODS

Occupational health services of a number of companies served as the source of data for the investigation of the work of diabetic employees. Through a questionnaire the members of The Netherlands Society of Occupational Medicine were asked about the possibility of their companies' participation in the study.

The companies were selected on the basis of the size of their working force and the quality of their medical records. The number of employees per company had to be large enough to make investigation worth while. In actual practice this meant that because diabetes is relatively infrequent at the main working ages only the very largest concerns could be considered for the study. The quality of the records kept by the health services determined whether diabetic employees could be identified: A number of companies with a sufficiently large working force to make them eligible for study had to be excluded because of the disproportionate amount of time required to locate their diabetic employees.

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In these terms only three companies among all those originally considered proved suitable for a study of this nature. They were the three largest concerns in The Netherlands, the N. V. Philips' Gloeilampenfabrieken in Eindhoven, the entire mining industry in South Limburg, and the national Postal, Telegraph and Telephone Company (P.T.T.), and even these companies had such a small number of female diabetic employees that the investigation had to be limited to male diabetic employees.

For a study of this type it would be extremely useful to be able to express in concrete terms the value of an employee or a group of employees to a company. Unfortunately this can not be done in simple numerical figures, and various alternative methods such as analysis of sick absence, estimates made by an immediate supervisor or foreman, performance evaluation, etc., have been tried, but such methods reflect only one facet of the problem. In addition, in evaluating records it is essential to be able to tell whether sickness or some quite different factor was responsible for an unexpected change of work by a given employee.

It was originally intended that the present study cover sick absence for the period 1948 through 1956 at Philips and in the mining industry, and the years 1955 and 1956 at the P.T.T. At a later date it was extended to include the type of work done by the diabetics in 1955-1956 and the relation of these types of work to their expected careers in the company. Wherever possible the data on sick absence of diabetic employees are compared with those already compiled by the companies for the entire group of employees. Since the diabetic group comprises only 0.1 to 2 per cent (range according to age) of the total group and the control data were available only for the total group, the diabetic group has consequently been compared with the total group (i.e., including the diabetics). Data on the work performance of the diabetics were generally not comparable to those of the total group and have therefore primarily casuistic value.

The record system in use in each case determined the methods by which the diabetic employees of these companies were traced. Of the three methods used, each had its limitations but gave the greatest reliability for a given application, and in all cases selection as to sick absence or job problems was avoided. The data collected per individual concerned both the nature and duration of the diabetic condition, its severity, possible stabilization difficulties, information about other diseases, about the number, duration of and reason for sick absence, and the type of work done in and before 1955.

#### THE INVESTIGATION MADE AT THREE LARGE COMPANIES

An investigation to determine the work potential of diabetics was carried out in the three large companies mentioned previously. The size of the working force and the quality of the records of the occupational health services of these companies guaranteed within reasonable limits the possibility of studying their diabetic employees. The methods of investigation were adjusted to locally prevailing conditions.

The prevalence of diabetes in a given employee population depends on its age composition, the sex of the employees, the prevalence in the local population at large, the policy of selection for employment and, if detection is a routine practice, of the sensitivity of the method of detecting glycosuria. Of the three companies involved in this investigation, in one, early detection of diabetes was a regular procedure applied to all its wage earners; in another, only part of the total group was subjected to periodic health examinations including urinalysis, and in one company no detection program was carried out. The number of diabetics traced in this investigation also depended on the systems of documentation used by the individual occupational health services.

In the period 1948 through 1956 at the Philips' Gloeilampenfabrieken seventy-nine male diabetics were found in the group of wage earners with an approximate annual "prevalence" or proportion of five per 1,000; in the mining industry 123 male diabetics with an approximate annual "prevalence" of one to two per 1,000; and in the period 1955-1956 at the P.T.T. 262 male diabetics with an approximate annual "prevalence" of five per 1,000. For the investigation of working capacity there were available in 1955 data on 65, 103, and 262 employees of these concerns, respectively. This difference in figures is due to the fact that in 1955 some of the employees originally included in the investigation were no longer available. Two thirds of the diabetic groups investigated consisted of men of forty-five years and over, which is not surprising in view of the fact that diabetes is more frequent in older people. At Philips and in the mining industry, the largest number of diabetic employees was found in the forty-five to fifty-four-year age group, at the P.T.T., in the group which was fifty-five years and over. The "prevalence" by age group varied from less than one per 1,000 to twenty-six per 1,000.

The average total duration of employment was about twenty years, and duration after diagnosis of diabetes mellitus was about six years. In the mining industry, however, the duration of employment after diagnosis of

diabetes mellitus was shorter due to the frequency of retirement at ages below sixty-five. Of the total group of 464 diabetics, 436 developed the condition during employment by the company.

The severity of diabetes measured according to need for insulin treatment differed for the three companies. At Philips, one third of the diabetics were treated with insulin, in the mining industry two thirds, and at the P.T.T. one half. This reflected an inverse correlation with the number of diabetics found by way of early detection. Each of the companies had a few diabetic employees showing problems of stabilization, mostly of temporary nature.

A variety of chronic diseases was encountered among the diabetics, as could be expected in a group of this age composition. Cardiovascular diseases were found in about 20 per cent of the total group of diabetics. A surprising finding was that in the group of 123 mine workers only sixteen suffered from this type of disease but their average age was slightly lower than that of the diabetic group of Philips and P.T.T. Also common were diseases of the locomotor system, chronic bronchitis, stomach ulcers and gall bladder conditions. Special attention has been given to overweight. This condition was found in two fifths of the diabetic group, and there was more of it in the patients not receiving insulin than in the insulin-treated diabetics. Cardiovascular diseases were found in equal measure in these two groups of patients.

The group of 464 diabetics was too small and too heterogeneous for statistically valid conclusions; the findings of the sick absence study are therefore formulated in broad terms as follows:

1. At Philips and in the mining industry the percentage of persons with no absences in the diabetic group was identical with that of the control group. At the P.T.T. that of the diabetics was slightly lower. There are thus proportionally just as many nonabsentees among the diabetic employees as among the total group of employees.

2. The number of spells of sick absence during the observation period, related to the average number of persons under observation, was the same among the diabetic employees for all three companies as that of the total group, i.e., there is an equal number of spells of sick absence per man in both groups.

3. The length of absence, determined from the number of days absent, is in most cases greater for the diabetic group. This applies to the Philips group to only a limited extent; the mining industry and the P.T.T. groups show wider differences, although not of a nature to

permit conclusion that the difference is important.

The proportional sick absence figures, which give a good picture of the proportion formed by the diabetic group in the sick absence total for the whole group, give a clear illustration of the findings just presented (tables 1 and 2).

Absence due to stabilization problems formed only a small proportion of the total sick absence of diabetics at Philips and the P.T.T. With the mining industry this was quite different, primarily because of two factors: the greater clinical severity of the mine workers' diabetes and the fact that for a number of these diabetics it was difficult to find suitable work on short notice (by suitability is meant regular, daytime duty without heavy physical exertion), with the result that they were absent more than would normally have been necessary in terms of their general state of health.

The investigation of working capacity concerned the types of work done by the diabetics in the period 1955-1956 and, where such information could be collected, the course of their careers in the company. Activities in the three companies naturally diverge considerably. The Philips factories are mainly concerned with the manufacture of electrical equipment; production of coal by the mining industry involves both underground and surface work; some of the work at the P.T.T. is administrative and some is physical work such as the mail-delivery service or technical services. The underground work and some of the surface work in the mining industry and the work of the mail-delivery service of the P.T.T. are considered to be heavy labor. At Philips and in the mining industry only blue collar and the lower level white collar jobs are represented, at the P.T.T. all functions.

In the Philips factories where heavy labor is exceptional, only three out of sixty-five diabetics were engaged in that type of work. For the mining industry this figure was fifty-five out of 103. Of the 262 diabetics working for the P.T.T. 148 did physical labor, eighty-one of them heavy and fifty-six medium-heavy. This means that in the mining industry and at the P.T.T. combined, 192 of the 251 diabetics who did physical labor were engaged in heavy or medium-heavy work. This finding is amazing considering the generally accepted policy of placing diabetics in nonheavy labor.

As far as information on shift work was available it was found that two of the sixty-five diabetics at Philips, fifty-four of 91\* in the mines, and at least seventy (the

\*The working hours of twelve of the 103 diabetics at the mines could not be traced at the time of the investigation.

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TABLE 1

Proportional rates of sick absence of diabetic workers by industry and age groups

	Industry Age group	Diabetics		Ratio among diabetic employees to all employees x 1,000		
		Number	Per 1,000 total employees	Number of employees with sick absence	Number of spells of sick absence	Work time lost for sick absence
1954	Philips under 45	10	1.4	2.0	1.6	2.2
	45 and over	40	11.6	10.4	8.9	10.2
	all ages	50	4.7	4.6	3.9	6.1
1955	under 45	14	1.9	2.5	3.3	6.9
	45 and over	43	12.1	10.4	10.5	11.7
	all ages	57	5.3	4.9	5.5	9.2
1956	Mining industry* under 45	24	0.5	0.5	0.6	0.9
	45 and over	63	5.1	5.2	6.7	7.6
	all ages	87	1.6	1.5	1.5	2.9
1955	P.T.T. under 45	53	1.7	1.9	2.0	2.4
	45 and over	202	14.2	13.5	13.7	22.2
	all ages	255	5.6	5.7	5.6	13.4

\*Underground and surface workers combined

TABLE 2

Proportional rates of sick absence of diabetic workers in the mining industry for underground (U) or surface (S) work by age groups, 1956

Age group	Diabetics				Ratio among diabetic employees to all employees x 1,000					
	Number		Per 1,000 employees		Number of employees with sick absence*		Number of spells of sick absence		Work time lost for sick absence	
	U	S	U	S	U	S	U	S	U	S
under 45	12	12	0.5	0.7	—	—	0.6	0.7	0.8	1.2
45 and over	19	44	3.6	6.2	—	—	3.6	10.2	3.9	11.0
all ages	31	56	1.0	2.3	—	—	0.9	3.1	1.5	5.8

\*Data separated as to underground and surface work were not available for the control group.

mail carriers) of 262 P.T.T. diabetics worked on either a two- or a three-shift system. The large number in the mining industry is particularly striking. It should be noted that twenty-eight of the fifty-four diabetics on a shift system in the mines were also in the group of fifty-five engaged in heavy labor.

Estimation by the supervisors, which is subjective and therefore limited in value, was used at Philips and the mines. Of 168 diabetics, forty-two were classed as very good, 115 as good, and eleven as adequate. In the cases where the work was graded as only adequate, no relation could be found between the mediocre performance and diabetes.

An attempt was made to determine the extent of the influence of diabetes on the employee's duties and career. This is no easy matter. Past situations could no longer be accounted for in all instances at the time of

the investigation, although this occurred rarely. Often multiple rather than single circumstances are responsible for a change in a career. The worker's health is only one element in the picture, and diabetes is likely to be one of many factors involved, indeed may even be only the last straw. As well-supported an attempt as possible was made to evaluate the role of the diabetes in the picture, however, and working along these lines it can be said that in 70 per cent of the diabetic employees there was no change of work. This group did all types of work, some of it heavy, often in irregular shifts. In 11.5 per cent of the group, diabetes was the sole reason for change of work. In most cases the change concerned was from irregular shift-work to the same work in straight shifts; in some cases it meant change from heavy to lighter work, and in two cases it meant retirement with a disability pension. Five per cent of

the group required a change of work because of diabetes plus other reasons, mostly other diseases. In the remaining 13.5 per cent a change of work was effected because of other diseases and had no relation to the diabetes.

#### DISCUSSION

The present investigation has attempted to evaluate the diabetic employee against the background of the labor pattern as a whole. The positions and professions in which diabetics can be placed and those in which they are already represented are of course of interest in such a study, and attention was also given to the adjustment made by diabetics in their chosen work.

The use of the occupational health services as the source of the data for the study meant that the collected information concerned a selected group of employees. This method of investigation was nevertheless preferred because it was the only means available for making a comparative study of diabetics and nondiabetics.

The three large companies provided 464 diabetics for an extensive study of sick absence; in addition the type of work and work performance of 430 of these individuals were analyzed. The limited number and heterogeneity of the group made comparison with a control group unjustified, so that in the sick absence study differences were only considered significant if they were twice as great as the general experience. In such cases it is assumed that differences cannot in all probability be due to chance.

It should be noted here that in terms of present circumstances, no group of diabetic employees larger than the one described above could be found in The Netherlands for a comparative study of their place in the labor picture. The investigation of working capacity was limited to the diabetics.

The prevalence of diabetes in the employee populations found in this study is lower than in groups studied by others. In the study by Wade,<sup>17</sup> for example, not only the over-all prevalence but also the age-adjusted rates are higher than in the present study. A variety of circumstances are known to determine both prevalence and the number of diabetics actually found in this type of investigation. Whether in this case the prevalence among the population at large plays an important role is an open question.

The general conclusion concerning the sick absence of the 464 diabetics of these three concerns is that there are proportionally just as many nonabsentees among the diabetics as in the total group; that diabetics are responsible for proportionally as many spells of sick ab-

sence as the total group; and that they are absent relatively more days than the total group but not significantly so.

In the investigation of working capacity it was found that diabetics who perform nonheavy work during normal daytime working hours, in which risks resulting from a reduced level of consciousness are not encountered, constitute no special occupational health problem. Results of this study show further that a considerable number of diabetics are capable of medium-heavy and heavy work, even outside normal daytime shifts.

A few serious occupational-medical problems have appeared in relation to certain diabetics with stabilization difficulties. Here the attitude of the patient toward his diabetes was of great importance. In a number of cases of diabetes its combination with another disease incapacitated the patient and resulted in a change of work or retirement on pension.

At the conclusion of this intensive study of the largest group of diabetic employees available in The Netherlands for such an investigation, it is still not possible to generalize about the working capacities of the diabetic population. This negative conclusion is in itself of great significance, because the idea that there are important differences between diabetics and those who do not suffer from this disease is untenable on the basis of the results of this study.

The general propositions that diabetes is or is not an occupational health problem are both inaccurate. Each decision about the ability to work must be approached individually, and the judgment always based on the severity of the diabetes, the presence of other diseases, the attitude of the patient toward his physical condition, the nature of the work, and the circumstances under which the work must be performed.

#### SUMMARY

A total of 464 male diabetic employees of three large companies was studied to obtain information about (1) whether the diabetic is partially handicapped in performing work compared with the nondiabetic and (2) whether the diabetic has increased susceptibility to illness which might result in temporary or permanent disability. The preparatory investigation showed that only the three largest Dutch companies could supply a group of diabetics to compare with nondiabetics in the same work situation.

In these companies the differences in sick absence between male diabetic employees and their respective control groups were not of importance. Those in non-heavy work with normal daytime hours in types of

work where partial loss of consciousness due to hypoglycemia cannot constitute a danger, represent no special employment risk. A considerable number of the 464 diabetic employees were found to be doing heavy work and also work at other than normal daytime working hours.

## SUMMARIO IN INTERLINGUA

*Diabete e Travaglio: Un Studio del Loco de Diabete in le Conjuncto del Travaglio*

Un total de 464 masculos diabetic, empleate per tres grande companias, esseva studiate pro obtener informaciones relative al questiones de (1) si le diabetico es partialmente obstaculate in le effectuation de su travaglio in comparation con le non-diabetico e (2) si le diabetico exhibi un augmentate susceptibilitate de contraher morbos, lo que poterea resultar in un invaliditate temporari o permanente. Un investigation preparatori habeva monstrate que solmente le tres plus grande companias hollandese poteva suppler un gruppo de diabeticos qui se prestava al comparation con non-diabeticos sub le mesme conditiones de travaglio.

In iste companias le differentias in absentias causate per maladia inter empleatos masculine diabetic e le correspondente gruppos de controlo esseva disproviste de importantia. Subjectos ingagate in travaglio non-pesante, con normal horas diurne de occupation, in typos de activitate in que le perdita partial del conscientate in consequentia de hypoglycemia non constitue un periculo, non representa un risco special de empleo. Esseva trovate que un numero considerable del 464 empleatos diabetic faceva travaglio pesante o travaliava a tempores altere que le normal horas diurne.

Obesity is not only an important nutritional problem in adults in this country, but also has become an important nutritional problem among school children. More than 10 per cent of the school children in two communities investigated were obese (*Nutrition Reviews* 15:6, 1957). Although long-term follow-up studies on the prognosis of obesity in childhood have not yet been carried out, a retrospective study of the role of juvenile obesity in adult obesity has recently appeared.

A. G. Mullins (*Arch. Dis. Child.* 33:307, 1958) recorded the age, sex, height and weight in 373 consecutive patients in a British medical outpatient department. One hundred and one of these patients were 20 per cent or more overweight when compared with the standard tables of W. F. F. Kemsley (*Ann. Eugen. Lond.*

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Among these patients, those that had been known "fatty" at school (the most practical criterion) were classified as a juvenile obese group. The obese group included 26 per cent of the men and 44 per cent of the women. Approximately one third of the obese group were cases of persistent juvenile obesity and included five men and twenty-seven women. When the degree of obesity was classed as mild, moderate, or even severe depending on the relative per cent overweight, the juvenile obese group made up 53 per cent of those classified as severely obese, but only 12 per cent of those with mild obesity.

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