Followup on Diabetic Suspects

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PERIODIC RETESTING for diabetes among persons who have had prior positive tests but have not been diagnosed as diabetic will identify many new cases of diabetes.

An initial blood or urine test is always included in diabetes screening programs to identify suspected diabetics. Although the criteria used to interpret these tests as positive vary since they are selected locally, screenees with positive results are regarded as the ones most likely to show positive results upon a more definitive retest and, upon referral to their physicians, to be diagnosed as diabetic. Results presented in this report show that many new cases of diabetes can be found when periodic tests are given to screenees with positive results who were not diagnosed as diabetic at initial screening.

A continuous diabetes screening program for Federal employees, instituted in July 1960, offered an opportunity to evaluate, over a period of several years, the yield of new cases in persons with positive test results who had not been diagnosed as diabetic upon initial screening. The screening is offered through the Federal employee health program and the diabetes and arthritis program, Division of Chronic Diseases, Public Health Service. Since this project has been described in a previous paper (*1*), only aspects of the procedure pertinent to this report will be mentioned.

In the Washington, D.C., metropolitan area, the diabetes screening program for Federal employees is conducted in the health units of several office buildings at one time. All participating health units are encompassed in the program within a period of 2 years. After each 2-year period, screening is again initiated in essentially the same units. Tests are made available to all who volunteer. Therefore, in most instances, an employee is offered a free diabetes test approximately every 2 years. If he should transfer or be moved to another building, the test may be offered to him within a shorter or longer interval.

Initial Screening

The initial screening test comprises a period of fasting, a glucose loading, and the drawing of a 2-hour venous blood sample. Screenees are instructed to eat their usual breakfast and to fast for 2 hours after they report for work. During the period when the presented data were being collected, each person was given two 2¼-oz. bars of fudge following his fast and directed to eat them within 15 minutes.

Each bar contained 78.8 gm. carbohydrates (sucrose, dextrose, levulose, maltose, and higher sugars), 16.0 gm. fat, and 2.0 gm. protein. With the exception of water, plain tea, or black, sugarless coffee, no food is allowed before the

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test. Venous blood specimens are drawn between 1 hour and 45 minutes and 2 hours and 15 minutes after the carbohydrates are eaten. The AutoAnalyzer is then used to make blood glucose determinations on plasma.

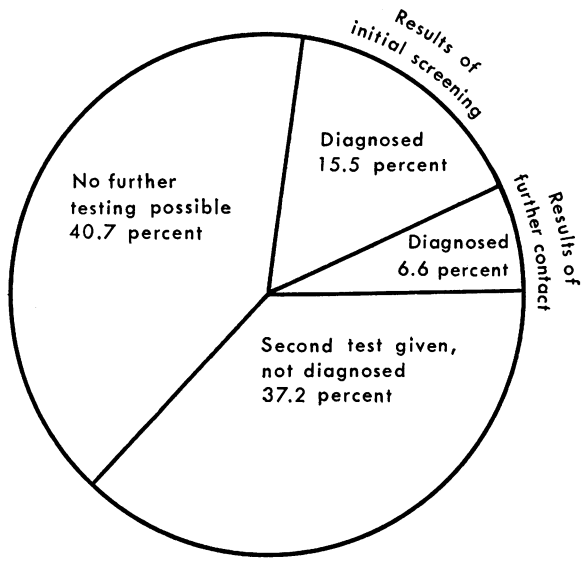
Readings on plasma at or above the level of 130 mg. per 100 ml. are considered positive. This level is considered comparable to a value of approximately 105 mg. per 100 ml. on whole blood (*2*). This critical level is considerably lower than the levels used in most diabetes screening programs, in which the usual values are 130, 160, and 180 mg. per 100 ml. for whole blood. The lower, more sensitive level is feasible in the Federal employee program because no participants who have screening levels between 130 and 299 mg. per 100 ml. are referred to a physician without retesting. The health unit physicians administer glucose tolerance tests to participants with such readings, and on the basis of these test results they refer to private physicians persons who, in their judgment, require diagnostic examination. Participants whose initial screening result is 300 or more mg. per 100 ml., however, are referred directly to their physicians. Thus, approximately one-third of the participants with positive screening results in the initial screening are referred.

Cases of diabetes diagnosed among various categories of participants in the Federal employee health program, diabetes screening project, Washington, D.C., during 2-year followup

Category	Number of persons	Total	New	Previously known
	Cases diagnosed June 1962			
Initial screening	18,690			
Positive results	[1] 1,922	297	259	38
	Cases diagnosed June 1962–Jan. 1, 1964			
Eligible for retesting	[2] 1,548	128	64	64
Diagnosed diabetic since initial screening	38	38		38
Volunteered for second screening	281	23	16	7
Accepted glucose tolerance test	467	56	41	15
Refused glucose tolerance test	457	6	3	3
No further test obtained	427			
Tested or diagnosed diabetic	[3] 30	6	3	3
Moved, transferred, or retired	305	5	4	1
No further test obtained	278			
Tested	[3] 27	5	4	1
Total by Jan. 1, 1964		425	323	102

[1] 10.3 percent of total screenees.
[2] Excludes 21 who had died since initial screening and 56 who were ineligible for further contact.
[3] Sample of 50 was selected, but not all participated in further testing.

Cases of diabetes found during 2-year followup of 1,922 screenees with initial positive results, Federal employee health program, diabetes screening project, Washington, D.C.



Of the 18,690 Federal employees tested in the Washington, D.C., metropolitan area in the first 2 years of the diabetes screening project, results were positive for 10.3 percent, or for 1,922 persons. The high percentage of persons with positive test results reflects the low screening level used in the Federal employee project. Following referrals based on this initial screening, physicians of participants diagnosed new cases of diabetes in 259, or 13.5 percent of the 1,922 having positive test results; these 259

represented 1.4 percent of the total screened population. An additional 2.0 percent (38 persons) of those with positive screening results were identified as known diabetics.

Retest Volunteers

Of the 1,922 screenees with positive results, 425 (approximately 1 of 4) were identified as diabetic during the initial screening and the 2-year-old followup period (see chart and table). Yet only 281 of the screenees with positive results and no diagnosis at time of initial testing volunteered for additional screening tests during the 2 years—only 18.3 percent of those living and eligible. (Twenty-one suspects had died during the period, and 56 were considered ineligible because they were no longer employed by the Federal Government and had not retired under the provisions of Federal employment.) Personal physicians of the 281 who volunteered to be retested diagnosed diabetes in 16 (5.7 percent). Seven (2.5 percent) of the 281 were identified as having previously known cases.

Invitations for Retests

The project staff believed that further tests on all suspects having no physician's diagnosis would be important to them. Therefore all such persons who had not volunteered for a retest were personally invited to have a glucose tolerance test. Fifty-one percent (467) of those eligible and still available to their health units took this test. Thirty-eight others in the same category, when recontacted for additional testing, stated that in the interim they had been diagnosed as diabetic by their physicians. Among the 467 who agreed to a new glucose tolerance test, diabetes was diagnosed in 41 (8.8 percent); known cases were reported for the first time in 15 (3.2 percent).

Among the persons with initial positive results who had received no physician's diagnosis, had declined to be retested, and were still available to their health units, a sample of 50 was offered an additional test. The project staff explained to this group, also, the importance of such testing. Among the 27 persons of the sample of 50 who thereupon took the glucose tolerance test, diabetes was diagnosed by their physicians in 3 (10.0 percent); 3 other persons reported that they knew they had diabetes and were not retested (10.0 percent).

Within a second sample of 50 persons, also with initial positive results and no physician's diagnosis, who had moved, resigned, retired, or transferred, 27 (the same number as in the other sample) accepted the offer of an additional test. Among the 27, private physicians identified 5 cases of diabetes: 4 cases (14.8 percent) were classified as new, and 1 case (3.7 percent) was reported as previously known.

Cases by Screenee's Category

Of the cases reported for the first time, both new and known, yields were higher among persons who had been persuaded to have a glucose tolerance test than among those who voluntarily participated in the rescreening programs.

Offering additional tests resulted in discovery of 128 new or recently identified cases of diabetes in persons who had shown positive test results but had not been diagnosed as diabetic at the time of the first test. These 128 cases represented approximately 8.0 percent of the total undiagnosed groups. Moreover, this percentage would have been higher if all persons in the undiagnosed groups could have been contacted or tested again. Of the 1,625 persons with positive results but no diagnosis during the initial followup, 843 received an additional screening test or glucose tolerance test; 782 received no further test.

About the same percentage of persons with initial negative test results (18.8 percent) as those with positive results (18.2 percent) volunteered for the second test. The yield of new cases in the 3,151 rescreened persons with initial negative results was 1.4 percent. Forty-three new cases were diagnosed, and one other was reported for the first time as a known case.

Twenty-two percent of the 1,922 persons with positive initial results were reported as diagnosed diabetics by private physicians. If all persons with such results had been contacted or retested, this percentage would have been higher. An additional 133 persons (7 percent of the 1,922 with positive results) showed results on a glucose tolerance test which health unit physicians interpreted as positive. As of January 1, 1964, however, private physicians

had diagnosed no new cases among these 133 persons.

How does the yield of new cases for this identified group of suspects compare with the yield obtained from other screening programs? The national median yield for the diabetes screening programs that were reporting in 1964 to the Public Health Service was 8.6 new cases per 1,000 persons tested (*3*). In screening programs in which testing is limited to high-yield groups (persons more than 40 years of age, overweight, or with a family history of diabetes), case yields based on diagnosis by private physicians are often as high as 20 to 40 per 1,000 tested.

All groups of persons with initial positive test results but no physician's diagnosis of diabetes had case yields many times higher than the 1.4 percent yield among the 18,690 persons originally screened. Yet only approximately 2 years had elapsed between identification of the suspected diabetic and subsequent testing.

The case yield of the two sample groups studied—those who had moved or retired and those who had previously declined retesting—might have differed more if, in each instance, the total sample of 50 had been retested or contacted. A higher proportion of new cases was diagnosed in the sample of the moved-retired group, which included many older persons, than in the other groups that were retested. Results in the sample groups were not generalized to the remaining untested population because so many persons in the two samples could not be tested.

People who volunteer for rescreening, it has been suggested, may do so because they are aware of a health problem. Therefore higher case yields would be anticipated than among those who initially decline additional screening. Our data do not substantiate this suggestion. Case yields were lower among those who volunteered for the second screening than among any of the other groups retested.

False-Positive Results

When results of a retest or examination for diabetes by a physician are negative, it is often assumed that the positive outcome on the screening test represents a false-positive result. Persons with such results are not regarded as having an abnormal glucose tolerance. Instead, test results are considered to have been falsely identified as positive because of lack of specificity of the screening test. In such cases the screenees are usually confident that they do not have diabetes. In only a few screening programs do the staff caution such persons that subsequent testing and observation by their physicians or the screening agency may be advisable.

It could be assumed that the proportion of false-positive results among the Federal employee group would be relatively high, since the critical level for the screening test was low. (The proportion of false-positive results in any population that is screened for diabetes is difficult to determine and is usually based on relatively arbitrary definitions.) We did not attempt to quantitate this proportion. We have been impressed, however, by our ensuing experience with screenees from this project with positive results. Within 2 years after the 18,690 persons were tested, almost 1 of 4 screenees with positive results was diagnosed as diabetic by his physician.

Recommendations

Careful consideration must be given to the results of these additional tests. The study data indicate that persons with positive results at initial screening who have not had a physician's diagnosis should be regarded as a highly suspect group and should participate in further diabetes testing. The yield of new cases was high when further testing was done within 2 years of the initial testing.

As a result of our experience in this project, we advise all persons who test positive in a screening test but who have not been diagnosed as diabetic to participate in future tests. Such a procedure is appropriate for all diabetes case-finding programs. The value of subsequent testing by the screening agency and of followup by private physicians is evident. Therefore, the screening agency should assume the responsibility of advising all screenees with positive results and no diagnosis that subsequent tests should be performed. And, if possible, the screening agency should routinely offer these tests.

Summary

In the Washington, D.C., metropolitan area, 18,690 Federal employees were tested for diabetes. Of these, 1,922 showed positive results on the initial screening test, and 297 new or known cases were identified. During a 2-year interval following the initial screening, 843 of the positive screenees who had not been diagnosed diabetic either received an additional screening test or a glucose tolerance test. Within this group, 128 additional cases of diabetes were identified. Almost one in four of the persons with initial positive results was identified by a private physician as diabetic within the 2-year period. This yield was achieved even though the critical level for identification of positive cases was low and 10.3 percent of the participants' screening results were positive.

We conclude that: (*a*) an agency offering diabetes screening tests should continuously provide testing to persons who have exhibited elevated blood glucose levels even if their retest results have been negative and they have therefore not been referred to their physicians, or were referred but received no diagnosis; (*b*) the yield of new cases of diabetes among persons with positive screening results but who have not been diagnosed as diabetic is exceedingly high even when a retest is done within 2 years of the initial testing; (*c*) efforts should be made to inform all diabetes suspects of the nature and symptoms of diabetes; and (*d*) staffs of screening agencies cannot assume that a large proportion of those with positive screening results but no physician's diagnosis of diabetes will voluntarily seek another test.

REFERENCES

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Dental Care for Head Start Children

The Public Health Service's Division of Dental Health is working with the Office of Economic Opportunity to provide dental care for half a million preschool children enrolled in Project Head Start during 1966.

Through a contract between the two agencies, the Division of Dental Health will provide consultant services and technical assistance to the Office of Economic Opportunity. Funds for dental programs will be sought first from local agencies, including those which supply dental care through State public assistance programs. Head Start will provide support when local resources are not sufficient to insure high-quality preventive and restorative services to each child.

Dental disease has ranked first among the health problems of enrollees in the project. Although most children had dental examinations during the 1965 summer program, followup care was given in very few communities. This year it is hoped that approximately 2 million cavities can be repaired in the deciduous teeth of children who otherwise would not be seen by a dentist.

Program Notes

More Professional Social Workers

Nearly 8,400 full-time students were enrolled in 60 U.S. graduate schools of social work in the fall of 1965—1,000 more than the year before and 3,000 more than 4 years before.

"Nevertheless," reported Fedele F. Fauri, dean of the University of Michigan School of Social Work, "we are losing ground in closing the gap between the supply and demand for professional social workers." For programs already in progress or provided for in new legislation, 60,000 to 70,000 more trained social workers by 1970 will be needed, he estimated.

Tuberculosis Testing of Infants

All children between the ages of 6 and 12 months of age should be tested for tuberculosis. The tests should be given, if possible, before the child has been vaccinated against measles or smallpox.

These recommendations were made by the American Academy of Pediatrics and the American College of Chest Physicians in a joint-committee statement appearing in the January 1, 1966, issue of the academy's *News Letter*.

The committee emphasized that tuberculous infection in children is still prevalent and that tests for tuberculosis should be repeated annually up to 4 years of age and thereafter every 2 years, depending on the risk of exposure of the child and the prevalence of tuberculosis in the population group.

The committee noted that early treatment with the drug isoniazid has been especially effective in young children.

Families of Multiply Handicapped

Multiply handicapped children whose families participated in a casework project set up by the San Francisco Department of Health now function better socially and make better use of their innate physical and mental capacities. This was the conclusion reached after evaluation of the project's first year of operation.

The bureau of maternal and child health initiated the program in October 1964 to help the families use the many interlocking services needed by multiply handicapped children.

A weekly discussion group, held at night so that fathers could attend, allowed parents of such children to feel "less isolated and different."—*Mental Retardation Bulletin* of the San Francisco Coordinating Council on Mental Retardation, December 1965.

Alcoholism Treatment for Women

New York State's first alcoholism treatment unit for women was established in 1965 at Central Islip State Hospital, Long Island.

The 60-bed facility, one of the few specialized units of its kind in the country, will admit voluntary patients from the New York City metropolitan area and is being established in response to widespread requests from mental health professionals and social agencies. The intensive treatment program includes individual and group psychotherapy, occupational and recreational therapy, and religious counseling.

How a Man Tries Counts

Not just a man's striving and drive to succeed relate to physiological variables such as cholesterol and serum uric acid, but the kind of striving, researchers at the University of Michigan suggest. The suggestion is based on a recent study of 136 professors at the university who were given detailed medical examinations and interviews to determine their physical condition, workload, and reactions to that workload.

"That one man drives himself and the other is driven seems to distinguish those men with high levels of serum uric acid from those with high levels of cholesterol," the researchers concluded.

Another conclusion was that professors in major universities are a highly privileged group who are above average in health, feel socially appreciated, find freedom and fulfillment in their work, and have too little time "to enjoy the leisure they seem well equipped to appreciate."

The study was supported by the Cooperative Research Program of the U.S. Office of Education. Senior author of the report was Dr. John R. P. French, Jr., psychologist and program director in the Research Center for Group Dynamics, a unit of the University of Michigan's Institute for Social Work.

Alcoholics Anonymous Evaluated

A systematic study of the characteristics of the successful Alcoholics Anonymous member and of the movement's effectiveness in a southwestern city of the United States revealed:

Almost half of the 182 study subjects had never resumed drinking after joining Alcoholics Anonymous.

Characteristics of the 182 showed them to be fairly representative of the city's adult population in both education (average 12.5 years) and socioeconomic level.

The average age at which continuing sobriety began was about 42 years.

About two-thirds had at some time been hospitalized because of alcoholism.

Those never hospitalized seemed to be the most successful in staying sober.—*Quarterly Journal of Studies on Alcohol*, vol. 26, 1965, pp. 279–284.

Items for this page: Health departments, health agencies, and others are invited to share their program successes with others by contributing items for brief mention on this page. Flag them for "Program Notes" and address as indicated in masthead.

Legal note . . . Air Pollution Control

Tall smokestack which eliminated heavy concentration of industrial pollution at ground level near plant, by dispersion rather than by removal of pollutants, held "air pollution control facility" for purposes of tax exemption. *Ohio Ferro-Alloys Corp.* v. *Donahue,* 3 Ohio App. 2d 256, 210 N.E. 2d 273 (1965).

An Ohio Court of Appeals held that the cost of constructing a smokestack which resulted in the dispersal of pollutants, but not in their removal from emissions, was eligible for tax exemption. This holding reversed the Ohio Board of Tax Appeals, which had affirmed an order of the tax commissioner denying appellant corporation an air pollution control certificate necessary to obtain a tax exemption for amounts spent in the construction of an air pollution control facility. The issuance of such certificate is provided by Ohio law where the tax commissioner finds that a facility was designed primarily for the control of air pollution and was not intended for the sole benefit of the business installing it (Ohio Rev. Code, secs. 5709.20 through 5709.26).

From the opinion of the court, the Ohio Ferro-Alloys Corp. built its plant near the village of Brilliant, Ohio, in 1951. The company relied upon heat and natural draft to discharge the smoke and dust from its electrometallurgical furnaces through a monitor running principally along the roof. After a number of complaints were received from local residents and pressure was brought to bear by the village council, the company in 1955 erected a 400-foot stack near the furnace building and attached it to the existing monitor.

The volume of smoke discharged was approximately 700,000 cubic feet per minute and it was estimated to contain 5 or 6 tons of solids in a 24-hour period. The solid materials were described as volatilized silica with some alumina magnesia, iron or iron oxides, carbon, and chrome or chrome oxides. By carrying smoke somewhat higher than itself, the stack eliminated heavy concentration of particles at ground level. It did not, however, remove gaseous or solid pollutants from the smoke.

The company sought to exempt the costs of erecting the stack from the application of the general tax laws, by obtaining a pollution control certificate. The commissioner denied the certificate, and the Ohio Board of Tax Appeals, hearing the matter *de novo,* reached the same result, finding that a facility could qualify for such a certificate only "*by removing entirely or greatly reducing the amount of pollutant material that would otherwise be discharged into the atmosphere.*" (Emphasis supplied.) Appeal was taken to an intermediate Court of Appeals, as provided in the Ohio Code (Ohio Rev. Code, sec. 5717.04).

The Court of Appeals, in rejecting the position of the Board of Tax Appeals, cited the statute and said (p. 277):

"The fallacy of the foregoing finding of the Board is that the statute does not read '*for facilities which are designed to eliminate or reduce the amount of pollutants*' as the Board would have it read; rather it reads for '*eliminating or reducing industrial air pollution,*'—and it becomes just as obvious that if the Legislature had intended to limit reduction of pollution to that accomplished by only one of the recognized methods, that is, by removal of pollutants but not by dispersion of pollutants, it would have so provided. By interpolating the word 'pollutants' for the word 'pollution' as used by the Legislature, the Board reads into the statute something which is not there."

Noting a report from the Ohio Department of Health which stated that, although not an ideal method of control, the stack "may be the most practical and undoubtedly would reduce to a considerable extent" the air pollution, the court held (p. 277):

"Section 5709.21, revised Code, does not require

that the method be the ideal one or a particular one but provides that it must be primarily for control of pollution of the air as defined in section 5709.20 and be *suitable and reasonably adequate* for such purpose for which it is intended."

A second question dealt with by the court was whether the "breeching" connecting the stack to the furnace building and the lower part of the stack itself could qualify for the tax exemption under a statute which allows exemption only for that part of the facility used *exclusively* for air pollution control (Ohio Rev. Code, sec. 5709.25).

The court concluded that the breeching could properly be included, since the monitor existing prior to the erection of the smokestack was well able to carry smoke from the plant and the only purpose of the breeching was to conduct the smoke from the monitor to the chimney at a height above the monitor and approximately 85 feet above ground. The court also held that the lower part of the chimney, below the entrance of the breeching, was necessary to support the upper part of the chimney and hence was a part of the air pollution control facility.—DAVID F. POLATSEK, *attorney, Public Health Division, Office of the General Counsel, Department of Health, Education, and Welfare.*

PUBLICATION ANNOUNCEMENTS

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