Results of Diabetes Screening Activities, Fiscal Year 1959

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IN THE FISCAL YEAR ending June 30, 1959, 19 States, 2 Territories, and the District of Columbia reported results of diabetes screening activities to the Public Health Service. A total of 176,893 persons were reported tested in programs throughout the United States with an additional 19,191 screened in the Territories. From approximately 7,000 persons who screened positive, more than 4,000 were referred to their physicians for diagnostic evaluation on the basis of abnormal screening or retest findings. Approximately 1,100 cases of diabetes were discovered among persons who were not previously aware that they had diabetes, and 706 cases previously known to their physicians were identified and the patients were referred back to their physicians for care.

The total of persons tested probably does not include all who were screened since frequently the screening done during National Diabetes Week in November is on such an informal basis that neither the number of tests nor the results are known. Also being limited to community programs, the total does not include screening done in doctors' offices, hospitals, or private clinics. While information about testing programs is diligently sought through the Public Health Service regional offices, State health departments, publications, and other sources, undoubtedly some screening programs may have been missed. Except for National Diabetes Week activities, it is believed that the volume of screening not reported is relatively small.

Much of the testing during the year was done in the northeastern United States (table 1 and map). Some screening was also conducted in the Rocky Mountain and western plains areas, where a higher rate per population was achieved. The reported screening rate per 1,000 population ranged from 0.1 to 46.0 with an average of about 2 per 1,000 population tested. Only five reporting States tested more than 5 per 1,000 of the population, indicating that only a small segment of the population was reached.

From the distribution of persons tested (table 2), it may be generalized that practically all were in programs testing blood specimens. Studies have shown that blood sugar screening tests indicate more diabetics than do urine tests when they are compared at levels where each test separates out the same proportion of nondiabetics (*1*). Of the total persons reported tested only about 3,000 (2.3 percent) were in programs which used any urine sceening at all, and only a minute fraction (0.3 percent) were tested solely for urine sugar. Table 3 shows that almost 90,000 persons were tested in programs conducted for the general population; testing directed at employee groups accounted for the next largest number, 25,000 persons. The age data indicate that the programs have not concentrated on the older age groups in which the probability of having diabetes is higher. Since screening for diabetes is frequently coupled with other types of screening,

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Table 1. Diabetes screening activity reported to Public Health Service during fiscal year 1959, by geographic area

Area	Persons tested			Screened positive	Positive after screening and retesting	Referred to physician	Number of cases found	
	All programs		Followup programs				Known	New
	Total	Rate per 1,000 population [1]						
States	176,893	2.2	154,544	7,065	[2] 4,440	4,064	706	1,105
Arizona	14,333	11.8	14,333	511	235	235	64	69
Colorado	14,588	8.8	14,588	178	178	178	45	27
Connecticut	505	.2	505	13	13	13	7	2
District of Columbia	37,687	46.0	37,687	1,898	841	643	127	376
Florida	615	.1	615	19	15	13	6	4
Hawaii	18,641	31.1	18,641	1,347	[2] 288	288	116	172
Iowa	3,267	1.2	2,267	123	71	60	0	33
Kansas	11,342	5.4	9,692	257	257	257	77	46
Kentucky	4,208	1.4	4,208	136	105	77	9	13
Maine	2,736	2.9	2,736	28	28	28	4	5
Michigan	14,275	1.8	14,275	179	179	179	24	72
Nevada	1,090	4.0	1,090	32	32	32	0	1
New York	17,964	1.1	2,143	670	670	670	29	28
North Carolina	2,382	.5	2,025	201	165	99	22	29
Ohio	12,244	1.3	12,244	574	464	393	39	71
Oklahoma	1,682	.8	1,288	41	41	41	0	8
Pennsylvania	5,272	.5	5,272	218	218	218	25	41
Tennessee [3]	2,189	.6	2,189	199	199	199	39	59
Virginia	8,746	2.3	8,746	306	306	306	73	49
West Virginia	3,127	1.6	0	135	135	135	----	----
Territories	19,191	[4]	19,191	859	719	464	124	173
Puerto Rico	9,313	[4]	9,313	712	582	375	120	94
Virgin Islands	9,878	[4]	9,878	147	137	89	4	79

[1] Estimated civilian population, Dec. 27, 1959, U.S. Bureau of the Census, Current Population Reports, P–25, No. 210.
[2] Number screened positive used when retesting program did not specify retest results.
[3] Health card screenees only.
[4] Not available.

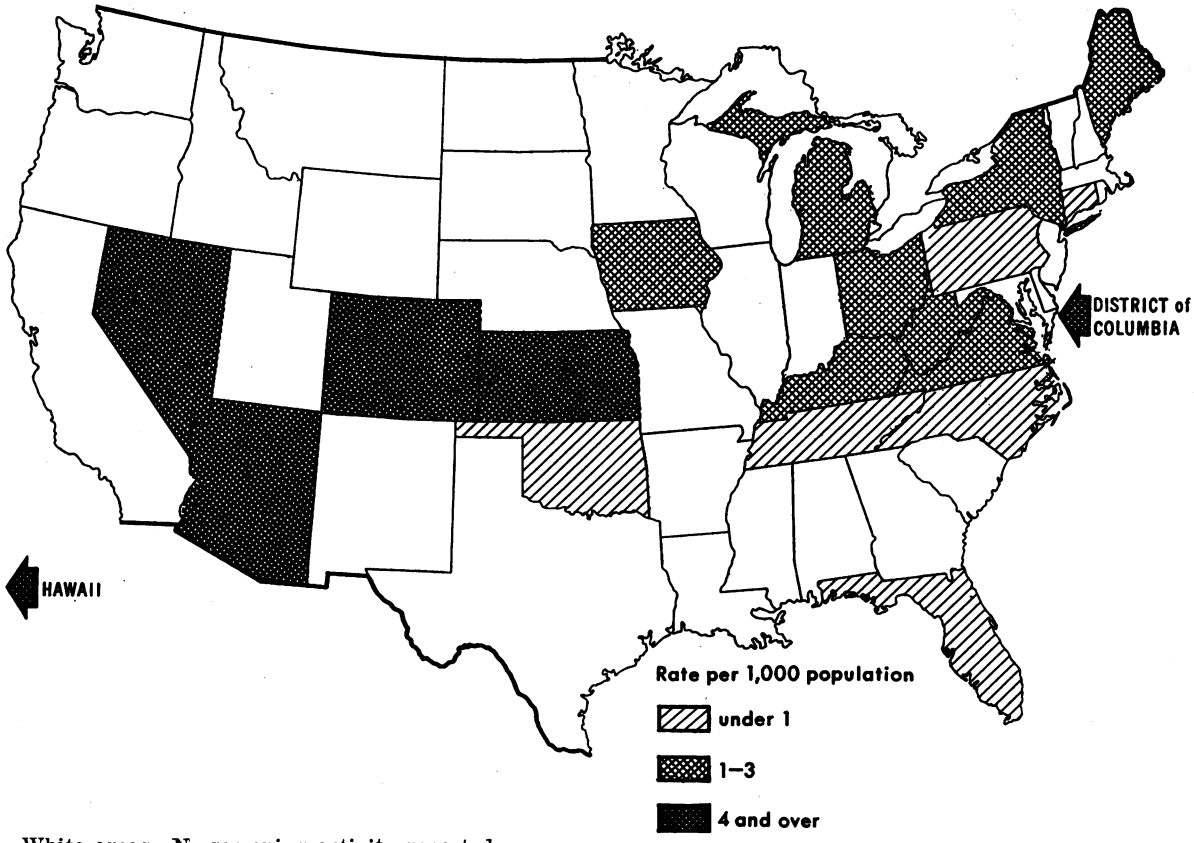
it is possible that the selection of age groups was influenced by factors not associated with diabetes, as for example in syphilis detection and in college or pre-employment health examinations.

More than half the initial blood sugar tests were performed on blood specimens screened at levels up to 130 mg./100 ml. On the assumption that the severity of diabetes is directly correlated with the level of blood sugar, a low screening level will detect mild or early diabetes in addition to the severe cases, but it will also result in more false positives. False positives may be separated out by retesting. Half the persons tested in the country, according to the reports, were in programs where retesting was done on all or on certain categories of participants with positive tests on initial screening before referrals were made to private physicians for diagnosis and treatment.

Retesting

Retesting is the reexamination of positive screenees under more carefully controlled circumstances, that is, at a set time after a high carbohydrate meal or after glucose ingestion. This reexamination is a confirmatory test to refine the number of initial positives to persons more likely to have diabetes. This method avoids swamping physicians with large numbers of persons who do not have diabetes, thus reducing costly and time-consuming inconven-

Diabetes cases reported to the Public Health Service as a result of screening activities, fiscal year 1959



White areas—No screening activity reported.

ience to both physician and screenee, and contributes greatly to the maintenance of physician interest and cooperation. The benefits of retesting can be seen in table 4, which shows that a little more than one-third of the persons with initial positive results are referred to physicians. A second benefit is that among these fewer referrals there is a higher concentration of diabetics. Table 4 also shows that the proportion of diabetes cases found among retested referrals is more than twice that found in the referrals from an initial screening test only. Some caution is in order since unknown factors, such as characteristics of the population screened and pretest eating requirements, may be operating to affect the results. Generally, the data support the value of including retest procedures before patients are referred to a physician. Program directors should consider the advantages of retesting even though a few cases may be missed. One should weigh the cost of followup and diagnosis of all positive screenees against the cost of retesting this group and the followup or diagnosis of approximately half of them.

Followup

Screening programs use followup to make sure that suspects pursue the course required to establish or rule out diabetes or to assure their return to treatment, as well as to obtain the cooperation of physicians in reporting dispositions of referrals. In screening programs doing followup there is evidence that diagnostic procedures had been completed on 78 percent of the 2,991 suspects referred to their physicians for diagnosis. A certain amount of time must be allowed for physicians to complete diagnostic procedures and report the results. The Public Health Service recommends that up to 90 days be allowed for making diagnoses and reporting dispositions of cases. Because of this

need for time to complete diagnoses, there undoubtedly will be later determinations on many dispositions reported as incomplete at the time of the cutoff date.

Nationally, a little more than one-quarter of the positive screenees referred to physicians between July 1, 1958, and June 30, 1959, were found to be nondiabetic, but this number varied greatly from program to program depending on diagnostic standards, type of population, age groups, the test used, and extent of retesting before referral to a physician. Positive screenees currently diagnosed nondiabetic are a profitable group for future casefinding. A recent community study has shown that the incidence rate among persons once screening positive is 8 to 10 times the rate among persons previously screening negative (*2*).

Almost one-fifth of the followup program participants who were referred to physicians for diagnosis were reported to have previously known diabetes. Unfortunately this figure has little meaning epidemiologically since it depends in large measure on program policies for processing known cases. These policies varied greatly among the programs. In some instances people were advised in publicity material not to present themselves for screening if they had already been told by a physician that they had diabetes. There were programs in which people were questioned at screening and turned away if they said they were diabetic. In other programs no questions were asked. There is, however, some advantage to including previously known diabetics in a screening program. These diabetics are referred to their physicians, and thus, contact between patients and their physicians is strengthened, and those who had lapsed from care are returned to medical supervision.

Almost a third of the persons referred to physicians for diagnosis represent previously unknown cases of diabetes. The overall yield is 6.9 new cases reported per 1,000 persons screened. As can be seen from the tables there is much variation in the yields for various categories. Because the various population groups shown were served by different screening techniques combined with different followup methods, a higher yield drawn from one group does not necessarily indicate a higher diabetes prevalence existing in that group.

Table 2. Results of diabetes casefinding activity reported to the Public Health Service,[1] fiscal year 1959

Screening method	Persons tested in followup programs		Results of followup							
			Total completed		No diabetes		Known cases		New cases	
	Total	Referred to physician	Number	Percent of referred	Number	Percent of followup	Number	Percent of cases found	Number	Yield per 1,000 tested
All methods	135, 903	2, 991	2, 344	78. 4	821	35. 0	590	38. 7	933	6. 9
Single test	66, 854	1, 588	1, 264	79. 6	600	47. 5	325	48. 9	339	5. 1
Retest	69, 049	1, 403	1, 080	77. 0	221	20. 5	265	30. 8	594	8. 6
Blood, 130 mg./100 ml. or less	75, 923	1, 631	1, 231	75. 5	333	27. 1	309	34. 4	589	7 8
Single test	13, 871	500	390	78. 0	204	52. 3	89	47. 8	97	7. 0
Retest	62, 052	1, 131	841	74. 4	129	15. 3	220	30. 9	492	7. 9
Blood, above 130 mg./100 ml	56, 882	1, 086	873	80. 4	382	43. 8	226	46. 1	265	4. 7
Single test	52, 074	1, 013	812	80. 2	370	45. 6	220	49. 8	222	4. 3
Retest	4, 808	73	61	83. 6	12	19. 7	6	12. 2	43	8. 9
Blood and urine [2]	2, 713	260	226	86. 9	93	41. 2	55	41. 4	78	28. 8
Single test	524	61	48	78. 7	13	27. 1	16	45. 7	19	36. 3
Retest	2, 189	199	178	89. 4	80	44. 9	39	39. 8	59	27. 0
Urine alone, single test	385	14	14	100. 0	13	92. 9	0	-------	1	2. 6

[1] For comparability, Hawaii excluded since followup data not sufficiently reported.
[2] Data from special research projects not indicative of usual programs.

The yield of previously unknown cases of diabetes was about a third greater in programs using screening levels of 130 mg./100 ml. or below than it was in programs which had higher screening levels, for example, 160 and 180 mg./100 ml. The yield was 7.8 cases per 1,000 screenees for programs which screened at levels up to 130 mg./100 ml. and 4.7 per 1,000 for program screening at levels above 130 mg./100 ml. Here again differences in techniques are involved, but recent studies support this finding (*3*).

Age

By age there are great differences in yield of diabetes cases. Persons 45 years of age and over produced yield rates five to six times as great as persons in the age group 20–44 years. Almost three-fifths of the screenees for whom age was reported were in this younger age group. Program efficiency, in terms of yield of cases, could be greatly increased by shifting screening effort from the low-yield younger age groups to the high-yield older age groups.

The progressive rise of rates with age was consistently noted in the individual programs reporting, as was the rate drop in the age groups over 75 years. This latter condition may be partly explained by selective forces of mortality operating to remove diabetics from this age bracket. It appears, from the programs for which age data are available, that perhaps programs cognizant of the ages of persons tested do better than other programs, since the overall yield in the former is almost twice as high as the yield in the latter.

Discussion and Summary

A thorough health maintenance examination once a year is considered an ideal way for a person to safeguard his health, particularly after the age of 40. A proper examination of this type includes a medical history, physical examination, and laboratory tests and procedures.

Table 3. Population characteristics and age of screenees in diabetes casefinding activities reported to the Public Health Service, fiscal year 1959

Population group and age (years)	Persons tested in followup programs		Results of followup							
			Total completed		No diabetes		Known cases		New cases	
	Total	Referred to physician	Number	Percent of referred	Number	Percent of followup	Number	Percent of cases found	Number	Yield per 1,000 tested
Total population	135, 903	2, 991	2, 344	78. 4	821	35. 0	590	38. 7	933	6. 9
General	89, 850	1, 904	1, 513	79. 5	457	30. 2	388	36. 7	668	7. 4
Employees	25, 270	260	230	88. 5	115	50. 0	51	44. 3	64	9. 7
Low income and welfare	8, 486	209	121	57. 9	40	33. 1	47	58. 0	34	4. 0
Clinic patients	7, 891	112	94	83. 9	19	20. 2	23	30. 7	52	6. 6
Inpatients	6, 886	160	133	83. 1	48	36. 1	40	47. 1	45	6. 5
Suspects	11, 809	255	196	76. 9	103	52. 6	36	38. 7	57	4. 8
Detention	3, 354	44	22	50. 0	10	45. 5	5	41. 7	7	2. 1
Students	385	14	14	100. 0	13	92. 9	0	-------	1	2. 6
Other	613	33	21	63. 6	16	76. 2	0	-------	5	8. 2
All ages [1]	49, 958	1, 083	882	81. 4	160	18. 1	224	31. 0	498	10. 0
Under 20	4, 086	8	5	62. 5	0	-------	1	20. 0	4	1. 0
20–44	29, 380	321	245	76. 3	57	23. 3	51	27. 1	137	4. 7
45–64	13, 103	568	484	85. 2	73	15. 1	124	30. 2	287	21. 9
65–74	2, 081	132	108	81. 8	16	14. 8	39	42. 4	53	25. 5
75–84	575	40	31	77. 5	8	25. 8	9	39. 1	14	24. 3
85 and over	96	3	3	100. 0	3	100. 0	0	-------	0	-------
Unknown	637	11	6	54. 5	3	50. 0	0	-------	3	4. 7

[1] Includes only programs reporting by age.

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Performance of laboratory tests for the entire population is impractical because the number of physicians, their necessary equipment, and the amount of funds needed by individuals and communities would be enormous. In view of the number of patients with obvious medical problems, busy physicians have difficulty finding time to make repeated routine examinations of presumably healthy persons. One of the most useful devices for conserving physician services is the public health screening program —using simple, inexpensive tests that can be given in a relatively short time to a large number of apparently well persons to sort out those who may have a disease from those who probably do not. The data in this report reveal that people, probably conscientious in safeguarding their health, are taking advantage of diabetes screening opportunities. However, the figures also show that for almost 50 percent of all persons with positive test results, no information was reported about their diagnostic status. In the 19 States reporting diabetes screening activities, more than 8 percent of the 4,440 persons with positive test results were not referred to a physician for diagnosis; for about 40 percent no diagnostic reports were received.

Diabetes screening programs, no matter how well designed and operated, are of little value as a community service unless all individuals screened as probably having the disease are followed for confirmation of whether or not they have diabetes. In turn, a diagnosis of diabetes is meaningless unless it is followed by medical care. Without followup, screening programs have not fulfilled their implied obligation to help maintain the health of participants who come to the screening line believing that they will receive a health service.

Screening is offered, by definition, to persons who are presumably free of the disease being screened. If an individual has a positive screening test, he has a right to know at the earliest possible time whether he can be reassured about his health or whether he is fortunate that diabetes has been diagnosed and treatment will begin promptly. When screening activities process persons who already have the disease, an additional contribution can be made by returning lapsed cases to treatment or by providing an opportuntiy for the physician to check that the benefits of therapy are being maintained.

From an administrative standpoint followup results are vital to the evaluation of a program. The yield in new cases is an important factor in measuring the success of a program, and a case is identified only when it is diagnosed by a physician. Data on yield of new cases can serve adequately to compare types of programs when these data are qualified according to variables such as screening test results and blood sugar level, age, sex, and socioeconomic group.

Reporting only on persons for whom a diagnosis has been made does not complete the followup process. Enumeration of persons not yet diagnosed by the physician to whom they were referred is necessary to evaluate followup procedures. Dawdling suspects and delayed reporting should be expedited by letter or a visit by a member of the program. Tabulations by the various causes of incomplete dispositions can well serve to indicate where breakdowns may have occurred in the followup procedure. A well-functioning followup system will reveal

Table. 4. New cases of diabetes found in selected casefinding programs, before and after retesting

Initial blood sugar level	Total cases found in initial screening	Referred for diagnosis		New cases found		
		Number	Percent	Number	Percent of—	
					Initial cases	Referred cases
130 mg./100 ml. or less:						
Not retested	501	500	99. 8	97	19. 4	19. 4
Retested	2, 848	1, 131	39. 7	492	17. 3	43. 5
160 mg./100 ml.:						
Not retested	847	834	98. 5	186	22. 0	22. 3
Retested	207	73	35. 3	43	20. 8	58. 9

the extent to which the diabetes screening program was successful in assuring that every person with a suspicion of diabetes was diagnosed and, if necessary, brought under treatment.

Reports of diabetes screening during fiscal year 1959 indicate that in each 1,000 persons tested, 40 persons had positive screening tests. Through retesting or loss during the referral process this number dropped to 23 who were referred to their physicians. Definitive diagnostic procedures were carried out for 17 persons. Approximately 10 persons per 1,000 in the screened population were diagnosed as having diabetes, of which 7 were new cases.

Programs being planned should consider these results as minimal. Detecting new cases of diabetes in nearly 0.7 percent of the population when compared with estimates of more than 0.8 percent in the literature (*4*) indicates a need for improvement in trying to reach all those people in the United States who have unrecognized diabetes. Programs should logically be more effective if they are directed toward known high diabetes prevalence groups such as persons over 40, relatives of diabetics, the obese, parents of large babies (over 9 pounds), and medical patients. In addition, programs should emphasize blood sugar testing, particularly of specimens obtained at set postprandial periods, as contrasted with specimens obtained at random times. Program planners should also consider the value of retesting, should use standardized diagnostic procedures, and should concentrate more effort on followup procedures (*5*). Optimal utilization of diabetes detection programs should produce yields greater than the national prevalence rate.

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Seat Belts and Blowby Devices

The General Services Administration of the Federal Government now requires all motor vehicles purchased by GSA to have seat-belt anchors and positive crankcase ventilation systems to reduce "blowby" emissions. GSA currently buys about 7,000 motor vehicles yearly to serve the various Federal agencies.

The "blowby" devices reduce the amount of gases, mostly hydrocarbons from unburned gasoline, which blow by the piston rings and into the atmosphere, contributing to air pollution. According to Dr. Luther L. Terry, Surgeon General of the Public Health Service, the devices required by GSA "are highly desirable, reducing total automotive emissions of hydrocarbons by about 25 percent at a very nominal cost." "As for seat belts," Dr. Terry said, "the best available statistics indicate that about 5,000 lives now being lost annually in automobile accidents could be saved through their universal use."