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ABSTRACT

Individual child data from the Preschool Screening Programs of 402 Minnesota school districts were analyzed for problem identification and referral rates, areas of problem identification and referral, sex differences in rates, and other factors. The results from over 45,000 children revealed large variability in rates among school districts, as well as differences as a function of the child's sex. Referral rates ranged from 0% to 72.7%. The most frequent problems identified and referrals made were in the areas of cognitive development (specifically speech/language) and hearing. Yet, variability among school districts also existed in areas where most problems are identified and referrals made. Results pointed out the need for further study of reasons for discrepancies in rates for males and females and for the wide variation found in both problem identification and referral rates. (Author/CL)

University of Minnesota

RESEARCH REPORT #1

PRESCHOOL SCREENING IN MINNESOTA: 1982-83

Martha L. Thurlow, James E. Ysseldyke, and Patrick O'Sullivan

EARLY CHILDHOOD ASSESSMENT PROJECT

August, 1985

Abstract

Individual child data from the Preschool Screening Programs of 402 Minnesota school districts were analyzed for problem identification and referral rates, areas of problem identification and referral, sex differences in rates, and other factors. The results from over 45,000 children revealed large variability in rates among school districts, as well as differences as a function of the child's sex. The implications of the findings for further research and practice are discussed.

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Preschool Screening in Minnesota: 1982-83

Martha L. Thurlow, James E. Ysseldyke, and Patrick O'Sullivan

School districts regularly screen children prior to kindergarten entrance. They do so for the purpose of identifying students who have health, physical, or developmental problems or who might be "at risk" for such problems. It is widely believed that early identification will facilitate early intervention and that early intervention will alleviate problems.

Recently, often in response to concerns about program costs, there has been increasing attention to the efficacy of early intervention. And, recent reviews show that early intervention is effective. White, Bush, and Casto (1984) found that 92% of a sample of 52 people who had reviewed early intervention research concluded that early intervention had substantial immediate benefits for handicapped, at risk, and gifted children. Casto and Mastropieri (in press) conducted a meta-analysis of the efficacy of early intervention with handicapped students. Based on their meta-analysis of 74 studies they concluded that early intervention produces a sizeable effect.

Less attention has been paid to the efficacy of preschool screening than to the efficacy of early intervention (see Lichtenstein & Ireton, 1984). And, there are few data describing the preschool screening process nationally. In 1977, the Minnesota Legislature established a statewide preschool screening program, the first mandated preschool screening program. Currently, 42 states mandate services to some portion of the preschool handicapped population from birth through age 5. Nineteen states mandate services for all

3 through 5-year-old handicapped children, and another 23 mandate services for some portion of that population (U.S. Department of Education, 1985).

There is little information on the extent of or results of preschcol screening. Important questions can be asked, but data on those questions frequently are elusive. National or state figures on the proportions of children who are screened, the numbers of those screened who are referred for further evaluation, the kinds of problems identified, sex differences in rates and kinds of problems, and sources to whom students are referred are difficult to find. Annually, the Minnesota Department of Education reports to the Minnesota Legislature a summary of preschool screening results. Data related to the above factors are included in some of the reports. In 1982, a decision was made to no longer collect information on individual children. Thus, data no longer are available to address the issues suggested by the factors. Because of this decision, the most recent available data (for 1982-83) were not analyzed by the state. This document is a description of data from the preschool screening program in Minnesota during the 1982-83 academic year.

Method

Subjects

All Minnesota school districts that had submitted preschool screening forms to the state education department were included as subjects. The screening forms contained information about each child screened during 1982-83. The state Preschool Screening Program (PSS)

collected information about the personnel involved in the screening program during 1982-83, as well as about the cost per child of each screening component. These data are presented in Table 1.

Of the 58,202 children eligible for screening during 1982-83, 81% (46,986) were screened (Minnesota Department of Education, 1985). Data from screening forms were available for 45,513 children (96.9% of those screened); information about other children screened was lost due to missing forms or erroneous data on forms. The 45,513 children were from 402 school districts. The average age of these children was 51.5 months (SD = 6.7 months). The sample included 49.0% female and 51.0% male children.

Procedure

As part of the screening process during 1982-83, preschool screening programs were required to submit an individual screening form for each child screened (see example in Appendix A). On this form, the screening program provided information on the child's birthdate and sex, along with screening results in the areas of height, weight, physical health, vision, hearing, fine motor development, gross motor development, speech/language development, social-emotional development, and cognitive development. Optional components of screening included physical inspection, laboratory tests, dental check, and nutritional assessment; this was the first year that these components (except laboratory tests) were not required parts of the screening. Laboratory tests had been dropped as a required component the year before.

Table 1

Percentages of Personnel Working in Various Screening Areas and Average Cost Per Child[a]

Screening Area	Personnel[b]						Cost per Child (Dollars)
	LSN	PHN	PHY	VOL	SPE	OTH	
Dental	19	40	4	1	0	36	1.46
Health History	33	53	2	1	0	11	3.07
Height/Weight	20	36	2	30	1	10	1.67
Lab Tests	16	57	7	2	0	18	1.98
Nutrition	27	54	1	1	0	18	.79
Physical	20	65	10	0	0	6	3.93
Developmental	3	8	0	23	53	14	4.93

[a]Percentages reflect the total number of personnel in a give category and screening area dividd by the total number of children screened within a given area.

[b]Personnel are designated as follows: LSN=Licensed School Nurse, PHN=Public Health Nurse, PHY=Physician, VOL=Volunteer, SPE=Special Educator.

Data from the screening forms were analyzed to determine the rate of problem identification and referrals resulting from the screening process. Also examined were differences in these as a function of the child's sex and inclusion of the physical inspection component.

Results

School districts in the study screened from 1 to 1,814 children in 1982-83 ($\bar{X}$ = 113.22, SD = 194.64). Most (59.3%) of these children were four years old.

Although the screening form used to collect data on individual children was relatively simple to complete (for the most part, it required only that checkmarks be made in relevant boxes), some possible problems in completing the form should be noted. For example, in some cases where a referral code had been entered (because a child was referred for further evaluation), the corresponding problem identification box was not marked. This type of coding difficulty reduced the problem identification rate below that which actually occurred. In other cases, a problem was noted, but a referral code was not provided. This type of coding might mean that a noted problem already was under someone's care, so no referral was made. However, it also might be an error in coding that would depress the referral rate below what actually occurred. Another type of coding problem involved the use of the letter "R" to indicate both the recommendation that a child be re-screened in a particular area and the actual re-screening of a child. To the extent that the "R" stood for a re-screening of a child for whom another form was completed, the

referral rate would be inflated. Because the exact meaning of the "R" could not be determined from the form, it was ignored.

For purposes of data analyses, it was assumed that these problems had a minimal influence on the results across the over 58,000 children screened. The coding discrepancies probably occurred to a greater extent in those districts in which greater numbers of forms had to be completed. Because data were transformed to percentages for analysis by school district, the effects of coding discrepancies were minimized. The possible influence of these coding factors, however, are noted where relevant.

Problem Identification Rates

Problem identification rates for school districts ranged from 0% to 100% of the students screened ($\bar{X}$ = 31.2, SD = 16.5). For an individual child, screening could identify up to 10 problems. For most children (69.2%), no problem was identified. For those children with a problem identified, the majority (67.8%) had a problem noted in just one area. Two problems were noted for 17.9%, three problems for 5.9%, four problems for 3.4%, and five problems for 3.1%; less than 2.0% of the children were identified as having either six, seven, eight, or nine problems. No children were identified as having problems in all 10 areas.

Table 2 is a summary of the average percentage of children per school district identified as having a problem in each of 10 areas and in a combined developmental area (reflecting at least one problem across the areas of fine motor, gross motor, speech/language,

Table 2

Percentages of Children for Whom
Problems Were Identified During Screening

Problem Area	$\bar{X}$	SD	Range
Height	0.6	2.0	0.0 - 26.3
Weight	1.3	3.2	0.0 - 27.8
Physical	5.0	9.5	0.0 - 48.6
Vision	6.2	8.3	0.0 - 100.0
Hearing	12.4	10.5	0.0 - 53.1
Fine Motor	5.4	6.8	0.0 - 71.4
Gross Motor	5.7	7.7	0.0 - 71.4
Speech/Language	8.8	8.7	0.0 - 53.3
Social/Emotional	2.8	5.5	0.0 - 71.4
Cognitive	3.4	6.0	0.0 - 71.4
Developmental[a]	13.6	11.8	0.0 - 71.4

[a]The developmental area includes fine motor, gross motor, speech/language, social/emotional, and cognitive development areas.

social/emotional, and cognitive development). The developmental area was the one in which problems were most frequently identified; an average of 13.6% of the students screened in a school district were identified as having a problem in this area. Hearing problems were next most frequently identified (12.4%), followed by vision (6.2%). Within the developmental area, speech/language problems were most frequently identified (8.8%).

Table 3 is a summary of the number of problems identified as a function of the child's sex and age. Of the children with identified problems, the distribution of males and females was similar as a function of number of problems. However, of the total number of children screened, those identified as having problems were 44.6% female and 55.4% male. (The overall distribution was 49.1% female and 50.9% male.) For children 3 to 5 years of age, the percentages of children identified as having problems decreased as age increased. The relative distribution across numbers of problems was relatively consistent, however.

School districts were asked to provide information on whether identified problems were existing problems or new problems. Frequently, this information was not provided. The available data are summarized in Table 4. In each problem area, except height and weight, there was a striking difference between the percentages of problems characterized as new and old, with new problems being identified about 80% of the time. For height and weight, the percentages of existing and new problems were similar. Caution must

Table 3

Percentages of Children Having Varying Numbers of Problems as a Function of Sex and Age

	Children with Problems[a]	Number of Problems[b]			
		1	2-4	5-7	8-10
Sex					
Male	55.4	20.1	6.9	1.0	0.0
Female	44.6	21.5	9.9	2.0	0.0
Age					
3 years	36.4	23.0	10.9	2.5	0.0
4 Years	29.4	20.6	7.6	1.2	0.0
5 Years	24.2	17.6	6.1	0.5	0.0

[a]Percentages reflect number of children with problem relative to total number screened.
[b]Percentages reflect number of children with different numbers of problems relative to total number with problems.

Table 4

Existing vs New Problems Identified[a]

Screening Area	Existing Problem	New Problem	No Information
Height	65 (51.6)	61 (48.4)	234
Weight	101 (42.4)	137 (57.6)	384
Vision	181 (13.9)	1122 (86.1)	1492
Hearing	278 (11.0)	2247 (89.0)	3426
Fine Motor	98 (15.3)	543 (84.7)	1646
Gross Motor	100 (15.8)	534 (84.2)	1597
Speech/Language	256 (17.9)	1178 (82.1)	2685
Social/Emotional	65 (19.5)	268 (80.5)	764
Cognitive	82 (16.8)	405 (83.2)	1065

[a]Entries in parentheses are percentages of those problems for which "existing" or "new" was specified.

be exercised in interpreting these data, however, since the number of cases for which no information was given exceeded the specified cases in every screening area.

Of the 402 school districts, 85 were identified as being ones that provided physical examinations of children. Information on the problem rate in each area for this group of school districts, compared to that for the school districts that did not include the optional physical component, is presented in Table 5. Differences in problem identification rates were significant in just the physical problems area, with a significantly greater percentage of physical problems being identified by those districts that included a physical component. This difference was reflected in the overall percentages of students identified during screening as having some type of problem (36.9% vs 29.3%, $t = 3.72$, $p = .000$).

Referral Rates

The referral rates for school districts ranged from 0% to 85.7% of the students screened ($\bar{X} = 24.3$, $SD = 16.1$). Table 6 is a summary of the average percentage of children per school district referred in each of nine areas (referrals for physical problems were not calculated) and in the combined developmental area. As for problem identifications, most referrals were made in the developmental area (12.0%), followed by hearing (11.2%). Speech/language referrals (8.0%) were the most common within the developmental area.

The sex distribution of students who were referred was 43.8% female and 56.2% male (compared to overall distribution of 49.1%

Table 5

Problem Identification Rates in Each Screening Area for Districts Giving or Not Giving Physicals

Area	Physical		No Physical		t	p
	X	SD	X	SD		
Height	.56	1.7	.56	2.1	.01	ns
Weight	1.48	2.9	1.22	3.3	.73	ns
Physical	14.05	13.4	2.64	6.3	7.60	.000
Vision	5.55	6.2	6.09	7.1	.69	ns
Hearing	13.15	11.1	12.06	10.1	.82	ns
Fine Motor	5.73	6.4	5.32	7.0	.51	ns
Gross Motor	6.59	8.2	5.47	7.6	1.14	ns
Speech/Language	8.43	8.6	8.91	8.8	.46	ns
Social/Emotional	2.70	4.5	2.83	5.8	.22	ns
Cognitive	3.38	5.2	3.46	6.2	.12	ns
Developmental	13.70	12.8	13.66	11.5	.03	ns

Table 6

Percentages of Children Referred During Screening

Problem Area	$\bar{X}$	SD	Range
Height	0.4	1.7	0.0 - 26.3
Weight	0.8	2.7	0.0 - 26.7
Vision	5.3	6.7	0.0 - 57.1
Hearing	11.2	10.6	0.0 - 48.5
Fine Motor	4.8	6.6	0.0 - 71.4
Gross Motor	5.0	7.5	0.0 - 71.4
Speech/Language	8.0	8.7	0.0 - 53.3
Social/Emotional	2.7	5.5	0.0 - 71.4
Cognitive	3.2	5.9	0.0 - 71.4
Developmental	12.0	11.6	0.0 - 71.4

female and 50.9% male). This reflects the discrepancy evident in problem identification rates. The percentage of children referred as a function of age was 30.1% of 3 years olds, 23.1% of 4 year olds, and 18.7% of 5 years olds. Again, this shows the decrease in percentage as age increases that was noted in the problem identification rates.

Table 7 is a summary of the primary places to whicn students were referred in each area. The school was mentioned frequently for each type of identified problem, with the percentage of referrals to the school ranging from 17.6% (height) to 96.4% (cognitive). Within the developmental area, the school was almost the exclusive referral agent.

Information on the comparison of referral rates in each area for school districts conducting physicals and school districts not including the physical component is presented in Tab'e 8. Differences in referral rates were not statistically significant in any of the areas. Physical problem referrals were not included in these analyses.

Problem Identification vs Referral

In many districts, there were relatively large discrepancies between the problem rate and the referral rate. Overall, as might be expected, the average referral rate (24.3%) was lower than the average problem rate (31.2%). The percentage difference for individual districts, however, ranged from 0% to 100%, with the average in number of children being 7.04 (SD = 19.78). A summary of the mean differences in number of children by screening area is presented

Table 7

Most Frequent Referrals for Each Problem Area

Area	Referral	Percentage
Height	MD	63.6
	School	17.6
	PHN	4.8
Weight	MD	44.4
	School	36.2
	PHN	6.7
Vision	School	47.9
	MD	25.2
	Optometrist	10.5
Hearing	School	57.0
	MD	26.8
	PHN	8.9
	Other	2.9
	Audiologist	2.2
Fine Motor	School	92.9
	Other	6.1
Gross Motor	School	92.0
	Other	6.8
Speech/Language	School	94.2
	Other	2.1
Social/Emotional	School	92.0
	Other	5.9
Cognitive	School	96.4
	Other	2.5

Table 8

Referral Rates in Each Screening Area for Districts Giving or Not Giving Physicals

Area	Physical		No Physical		t	p
	X	SD	X	SD		
Height	.50	2.74	.39	1.46	.33	ns
Weight	1.00	3.33	1.02	4.73	.04	ns
Vision	6.79	23.45	5.89	11.07	.34	ns
Hearing	13.64	39.39	12.41	23.68	.27	ns
Fine Motor	6.50	17.08	4.66	9.98	.95	ns
Gross Motor	6.29	17.10	4.40	8.50	.99	ns
Speech/Language	11.10	33.82	9.06	21.79	.53	ns
Social/Emotional	3.94	11.55	2.13	4.44	1.42	ns
Cognitive	6.04	21.18	2.86	6.02	1.36	ns
Developmental	15.67	45.91	12.91	25.34	.53	ns

Table 9. The largest differences occurred in the areas of hearing ($\bar{X}$ = 1.89) and developmental (1.62). Within the developmental area, the largest differences were noted for gross motor (.74), speech/language (.71), and fine motor (.63). The smallest differences between problem identification and referral were found in the areas of social/emotional development (.19) and cognitive development (.29).

Discussion

The present analysis of the results of the preschool screening of over 58,000 children produces an interesting picture for review and further analysis. A major finding of the analysis of both problem identifications and referrals is the extreme variability from one school district to another. Even when school districts that screened fewer than 25 children are removed from consideration, the referral rates ranged from 0% to 72.7%. The most frequent problems identified and referrals made were in the areas of cognitive development (specifically speech/language) and hearing. Yet, variability among school districts also exists in the areas where most problems are identified and most referrals made. For example, in some districts, almost all problems identified were hearing problems, while in others, almost all problems identified were gross-motor development problems, and so on. In all areas except height and weight the majority of problem identifications were of new problems. In all areas, the major referral agency was the school. In other words, children are referred into the traditional special education evaluation route to determine whether services are to be provided. The extent to which that

Table 9

Differences Between Number of Children with Identified Problems and Number Referred in Each Area

Problem Area	$\bar{X}$	SD	Range
Height	.46	3.98	0 - 65
Weight	.53	2.90	0 - 46
Vision	.82	3.78	0 - 40
Hearing	1.89	17.58	0 - 71
Fine Motor	.63	3.18	0 - 33
Gross Motor	.74	3.83	0 - 42
Speech/Language	.71	3.57	0 - 49
Social/Emotional	.19	1.45	0 - 21
Cognitive	.29	1.86	0 - 22
Developmental	1.62	7.21	0 - 69

procedure is appropriate might be questioned given the high placement rates and problems associated with typical team decision making in schools (see Ysseldyke & Thurlow, 1984).

The ratio of boys to girls was unever for both problem identifications (1.25 to 1) and referrals (1.30 to 1). Also, there was a tendency for greater percentages of problem identifications and referrals to be made at younger ages (although this conclusion is limited by the restricted age ranges).

The identification of a problem during preschool screening does not automatically mean that a child is referred for further evaluation or special services. In the present analysis, the differences between the number of children identified as having a problem and the number of children who were referred ranged from 0% to 100%. The Minnesota Department of Education (1985) has suggested that such discrepancies occur because some children for whom problems are identified already are under adequate care (e.g., for a chronic health problem).

Another interesting finding relates to the inclusion of a physical component in the screening process. This component was not required during the 1982-83 screening. The Minnesota Department of Education (1985) has indicated that deletion of this as a required component has resulted in a decrease in identification and referral of students with physical health problems. In the present analysis, a comparison was made between school districts that included a physical component and school districts that did not. When problem identification rates were examined, a significant difference was found in the physical area, with those districts including the physical

component identifying nearly seven times as many problems as those districts without the physical component. Differences in problem identification were not found in the other areas screened. Similarly, no differences were found in the numbers of referrals made in all areas. No analyses were conducted on physical referrals.

The results obtained in this analysis of preschool screening data from 1982-83 suggest several issues that require further study. For example, discrepancies in rates for males and females in the developmental areas are clear in these results. Further investigation of the possible reasons for these discrepancies (including possible bias in procedures used) should be studied. The role of the physical screening components in the identification and referral of problems also deserves further study. A more controlled methodology should be used to examine differences in the screening process resulting from its inclusion.

Perhaps the primary issue that requires further investigation and consideration is the wide variation found in both problem identification and referral rates. While it is possible that errors in coding information on the forms may have occurred, it is questionable whether these could have significantly skewed the results from over 45,000 children. Districts with high rates were not located in any single geographic area; high and low districts were found that were next to each other. There are several factors that might account for, or at least be related to, problem identification and referral rates. Possible economic, social, political, and educational factors should be considered.

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Appendix A

Sample Individual Screening Form

SEND FORM TO: Pupil Personnel Services, MN Dept. of Education, Capitol Square, 550 Cedar, St. Paul 55101

PSS

CHILD SCREENING FORM

CLAIM PROCESSING DOCUMENT CONTROL NUMBER 1

ELITE PICA

TYPEWRITER ALIGNMENT
USE CAPITAL LETTERS ONLY

ELITE PICA

PROVIDERS NAME 2

PROVIDER ID # 3

OWN REFERENCE # 4

BILLING DATE 5

CITY/STATE/ZIP

PHYSICAL DONE BY 7 NURSE 8 PHYSICIAN

SCREENING DATE 9

CHILD'S NAME (LAST, FIRST, INITIAL) 12

MEDICAL ASSISTANCE NUMBER 13

SEX 14

BIRTHDATE 15

RESULTS

	ABNORMAL	REFERRAL CODE
WEIGHT		16
HEIGHT		17
PULSE		19
BLOOD PRESSURE		20
HEAD		21
EYES		22
EARS		23
NOSE		24
PHARYNX		25
NEUROLOGICAL		26
NECK		27
CHEST/LUNGS		28
HEART		29
ABDOMEN		30
GENITALS/SEXUAL DEVELOPMENT		31
MUSCULAR/SKELETAL		32
SKIN		33
VISION		34
HEARING		35
AUDIOMETER USED	YES	
DENTAL CHECK-UP IN LAST YEAR	NO	36
OBSERVED DENTAL PROBLEM	YES	37
NUTRITION		38

IF PHYSICAL NOT DONE (ITEMS 21 THROUGH 33), MARK BOX

DEVELOPMENT

	ABNORMAL	REFERRAL CODE
FINE MOTOR		39
GROSS MOTOR		40
SPEECH/LANGUAGE		41
SOCIAL/EMOTIONAL		42
COGNITIVE		43

LAB TESTS

	NORMAL	ABNORMAL	REFERRAL CODE
URINE			44
HEMOGLOBIN/HEMATOCRIT			45
BLOOD LEAD			46
SICKLE CELL			50
OTHER			51

MARK WITH A STRAIGHT HORIZONTAL LINE

IMMUNIZATIONS

	CURRENT	GIVEN	REFERRED	RECORD NOT AVAILABLE
DTP/Td OR DT				
POLIO				
MMR OR MEASLES (RUBEOLA)				
OTHER				

	CURRENT	GIVEN	REF.	N/A
MUMPS				
RUBELLA (GERMAN)				

REFERRED TO 52

CHARGE INFORMATION

UNIT COST 52

ACTUAL READINGS — OPTIONAL

WEIGHT 53 HEIGHT 54 PULSE 56 BLOOD PRESSURE 57 HEMOGLOBIN/HEMATOCRIT 58

ENTER NUMBER OF MONTHS SINCE LAST HEALTH MAINTENANCE EXAM 59 REFERRAL CODE 60

COMMENTS SECTION — PLEASE EXPLAIN ALL BOXES MARKED ABNORMAL AND/OR OTHER

PROVIDER CERTIFICATION

This is to certify that all information given on this form is true, accurate and complete and all medical services indicated have been rendered. I understand that payment and satisfaction of this claim will be from Federal, State and local funds, and that any false claims, statements or documents or concealment of a material fact may be prosecuted under applicable Federal or State laws. I certify that all applicable screening standards have been followed.

67 Authorized Signature

ECAP PUBLICATIONS

Early Childhood Assessment Project
University of Minnesota

No. 1 Preschool screening in Minnesota: 1982-83 by M. L. Thurlow, J. E. Ysseldyke, & P. O'Sullivan (August, 1985).

No. 2 Current screening and diagnostic practices for identifying young handicapped children by J. E. Ysseldyke, M. L. Thurlow, P. O'Sullivan, & R. A. Bursaw (September, 1985).

No. 3 Instructional decision-making practices of teachers of preschool handicapped children by J. E. Ysseldyke, P. A. Nania, & M. L. Thurlow (September, 1985).

No. 4 Exit criteria in early childhood programs for handicapped children by M. L. Thurlow, C. A. Lehr, & J. E. Ysseldyke (September, 1985).

No. 5 Predicting outcomes in a statewide preschool screening program using demographic factors by J. E. Ysseldyke & P. O'Sullivan (October, 1985).

No. 6 An ecological study of school districts with high and low preschool screening referral rates by. J. E. Ysseldyke, M. L. Thurlow, J. A. Weiss, C. A. Lehr, & R. A. Bursaw (October, 1985).