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Influence of Maternal Health Literacy on Child Participation in Social Welfare Programs: The Philadelphia Experience

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We examined the influence of maternal health literacy on child participation in social welfare programs. In this cohort, 20% of the mothers had inadequate or marginal health literacy. Initially, more than 50% of the families participated in Temporary Assistance for Needy Families (TANF), the Food Stamp Program, and Special Supplemental Nutrition Program for Women, Infants, and Children, whereas fewer than 15% received child care subsidies or public housing. In multivariate regression, TANF participation was more than twice as common among children whose mothers had adequate health literacy compared with children whose mothers had inadequate health literacy. (*Am J Public Health*. Published online ahead of print July 15, 2010: e1–e4. doi:10.2105/AJPH.2009.172742)

Reports have documented underenrollment in public programs known to improve child health (e.g., food or cash assistance, housing).[1–8] Although the mechanisms underlying this phenomenon are complex, one possible explanation is that participation is hampered by the literacy demands of the application process. Low health literacy ("an individual's ability to read, understand and use healthcare information to make decisions and follow instructions for treatment"[9]) affects more than 90 million American adults (approximately 20% of the adult population).[10] In a prospective, longitudinal cohort study of Medicaid-eligible mothers and infants, we hypothesized that mothers with adequate health literacy would be more likely than those with inadequate health literacy to participate in public programs.

METHODS

We analyzed data from the Health Insurance Improvement Project,[11,12] a prospective cohort study of Medicaid-eligible mothers and their infants. Between June 2005 and August 2006, mother-infant dyads were recruited from a large Philadelphia, Pennsylvania, hospital's postpartum wards. Inclusion criteria were maternal Medicaid eligibility and maternal English proficiency. Exclusion criteria were gestational age younger than 36 weeks, birth weight less than 2500 g, and infants entering foster care or adoption.

Primary outcomes were self-reported participation in 5 social welfare programs: (1) Temporary Assistance for Needy Families (TANF); (2) Food Stamp Program; (3) Special Supplemental Nutrition Program for Women, Infants, and Children (WIC); (4) child care subsidies, and (5) public housing, measured with survey items adapted from the National Health Interview Survey. Covariates included child's sex and birth order; maternal age, education, marital status, and employment status; and household income. Maternal health literacy was measured with the short-form Test of Functional Health Literacy in Adults. Scores range from 0 to 36 and are categorized as follows: 16 or lower (limited); 17 to 22 (marginal); and 23 or higher (adequate).[13,14]

We used the χ^2 test to compare the rate of participation in each social welfare program among the literacy levels. We used best subsets multivariate logistic regression to estimate the relation between maternal health literacy and program participation. We assessed associations between explanatory variables to exclude multicollinearity.

RESULTS

Our study enrolled 744 participants (53.3% of eligible mother–infant dyads). No significant or clinically relevant differences were seen between participants and nonparticipants. Analytic sample sizes were 626 (of 744) at birth and 499 (of 580) at 6 months.

At baseline, 8% had inadequate (n=50) and 12% had marginal (n=75) health literacy. Most mothers were African American (80%), were single (87%), had more than 1 child (63%), and had annual household incomes lower than $12 000 (77%). No significant differences in health literacy were related to race/ethnicity (P=.16), marital status (P=.2), income (P=.44), or employment status (P=.26). Health literacy was related to education (P=.004; 38% with inadequate health literacy had an education beyond high school) and number of children (P=.019).

At birth, more than half of the families participated in TANF, the Food Stamp Program, or WIC, and fewer than 15% received child care benefits or public housing (Table 1). At birth and 6 months, children whose mothers had adequate or marginal health literacy were more likely (P<.05) to receive TANF. At birth, children of mothers with adequate or marginal health literacy were more likely to receive food stamps. No significant differences in participation in WIC, child care, or housing were related to health literacy levels.

In multivariate analysis (Table 2), children whose mothers had adequate or marginal health literacy were more than twice as likely to participate in TANF as were children whose mothers had inadequate health literacy at baseline and 6 months. Other significant predictors were number of children, income, and age. For food stamps participation, the association with maternal health literacy at birth was not statistically significant.

DISCUSSION

To our knowledge, our study is the first to examine the relation of maternal health literacy to public program participation. We found that mothers with poor health literacy were much less likely to receive TANF than were mothers with adequate health literacy. We also found that although maternal education and health literacy were highly correlated, maternal education was not distinctly associated with participation in any of the social welfare programs examined. Programs with streamlined institutionalized enrollment

TABLE 1—Maternal Health Literacy and Participation in Social Welfare Programs: The Health Insurance Improvement Project, June 2005–August 2006

	Birth (n = 626)					6 Months (n = 499)				
		Health Literacy, No. (%)					Health Literacy, No. (%)			
	Overall Participation, %	Inadequate	Marginal	Adequate	P[a]	Overall Participation, %	Inadequate	Marginal	Adequate	P[a]
TANF	52	17 (34)	44 (59)	266 (53)	.018	55	15 (36)	38 (62)	206 (55)	.03
Food Stamps	65	23 (46)	50 (67)	333 (67)	.01	71	26 (59)	43 (71)	272 (72)	.19
WIC	66	35 (70)	48 (64)	330 (66)	.78	93	43 (98)	57 (93)	345 (92)	.35
Child care	12	6 (12)	6 (8)	65 (13)	.47	29	8 (18)	24 (39)	108 (29)	.06
Housing	11	6 (12)	8 (11)	55 (11)	.97	14	6 (14)	9 (15)	53 (14)	.99

Note. TANF = Temporary Assistance for Needy Families; WIC = Special Supplemental Nutrition Program for Women, Infants, and Children. Analytic samples were 626 (of 744) at birth and 499 (of 744) at 6 months. No significant differences were found in the distribution of demographic variables (infant birth weight, maternal age, maternal birth country, maternal education, maternal employment) between the analytic sample and the full cohort (data not shown).

[a]*P* value for the χ^2 test of association between maternal health literacy and participation in social welfare programs. All analyses were conducted with SAS (Version 9.1.3; SAS Institute Inc, Cary, NC).

protocols, such as WIC, also appear to have much higher enrollment rates than do those with more complex and fragmented procedures.

These results had some caveats. First, generalizability is limited by the study population composition and single location. Second, self-reported data about public program participation are subject to recall bias. Third, only 53% of the eligible mothers participated; this could result in selection bias. Fourth, we did not analyze the literacy demands of the application process. Fifth, we chose a health literacy measure, which is correlated with but not the same as a more general literacy assessment.[10] Finally, we examined participation at birth and at 6 months of age; multisite observation over a longer period is likely to contribute additional information to assist policymakers in program development.

Our findings indicated that systematic changes in enrollment procedures can be made to promote participation in public programs that benefit children. Initiatives to increase enrollment in public programs might focus on simplifying procedures, whereas welfare-to-work evaluations may focus on promoting

TABLE 2—Multivariate Logistic Regression Results Showing Influence of Maternal Health Literacy on TANF and Food Stamp Program Participation at Birth and 6 Months: The Health Insurance Improvement Project, June 2005–August 2006

	TANF				Food Stamps			
	Baseline (n = 626)		6 Months (n = 499)		Baseline (n = 590)		6 Months (n = 472)	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Maternal health literacy								
Inadequate	1.00		1.00		1.00		1.00	
Marginal	2.41 (1.04, 5.61)	.04	2.61 (0.96, 7.11)	.06	2.13 (0.89, 5.08)	.09	1.59 (0.60, 4.23)	.35
Adequate	2.18 (1.09, 4.35)	.03	3.04 (1.35, 6.84)	.008	1.95 (0.97, 3.92)	.06	1.72 (0.78, 3.77)	.18
Maternal age, y								
≤20	1.00		1.00		1.00		1.00	
21–24	1.36 (0.80, 2.33)	.26	4.22 (2.11, 8.44)	<.001	1.63 (0.94, 2.83)	.08	1.37 (0.74, 2.54)	.31
25–29	1.10 (0.55, 2.21)	.80	3.13 (1.29, 7.62)	.01	2.13 (1.00, 4.55)	.05	0.92 (0.38, 2.23)	.86
30–34	0.59 (0.25, 1.40)	.23	2.49 (0.79, 7.85)	.12	0.86 (0.35, 2.11)	.74	0.50 (0.17, 1.48)	.21
≥35	0.08 (0.02, 0.41)	.003	1.57 (0.36, 6.79)	.55	0.37 (0.12, 1.15)	.09	0.24 (0.06, 0.93)	.04
Income, $								
<250/mo	1.00		1.00		1.00		1.00	
251–500/mo	1.43 (0.86, 2.37)	.16	1.04 (0.55, 2.00)	.9	1.18 (0.68, 2.03)	.56	2.76 (1.35, 5.65)	.005
501–999/mo	0.62 (0.36, 1.07)	.09	0.29 (0.14, 0.59)	.001	0.79 (0.43, 1.42)	.42	1.32 (0.66, 2.66)	.44
1000–1499/mo	0.17 (0.08, 0.36)	<.001	0.11 (0.04, 0.27)	<.001	0.31 (0.15, 0.64)	.001	0.68 (0.28, 1.62)	.38
>1500/mo	0.20 (0.10, 0.41)	<.001	0.07 (0.03, 0.17)	<.001	0.28 (0.14, 0.57)	.001	0.49 (0.22, 1.11)	.09

Continued

TABLE 2—*Continued*

No. of children								
1	1.00		1.00		1.00		1.00	
2	1.65 (1.02, 2.67)	.04	1.33 (0.74, 2.38)	.34	2.10 (1.29, 3.41)	.003	2.90 (1.61, 5.19)	<.001
≥3	3.05 (1.78, 5.22)	<.001	2.62 (1.36, 5.04)	.004	5.53 (3.07, 9.96)	<.001	9.37 (4.44, 19.77)	<.001
Education								
Less than high school	1.00		1.00		1.00		1.00	
High school	0.81 (0.49, 1.34)	.41	0.67 (0.35, 1.29)	.23	0.72 (0.43, 1.23)	.23	1.00 (0.52, 1.92)	.99
High school or greater	0.80 (0.49, 1.29)	.36	0.42 (0.22, 0.77)	.006	0.89 (0.53, 1.50)	.66	0.74 (0.39, 1.39)	.35
Race								
Black	. . .	. . .	1.00		. . .	. . .	1.00	. . .
Other	. . .	. . .	0.44 (0.23, 0.84)	.01	0.62 (0.38, 1.02)	.06	0.53 (0.29, 0.99)	.05
Employment								
Student	. . .	. . .	1.00		. . .	. . .	. . .	. . .
Full time	. . .	. . .	1.49 (0.78, 2.84)	.23	. . .	. . .	. . .	. . .
Unemployed, looking for work	. . .	. . .	0.66 (0.27, 1.59)	.35	. . .	. . .	. . .	. . .
Unemployed, not looking for work	. . .	. . .	2.39 (0.96, 5.92)	.06	. . .	. . .	. . .	. . .
Missing	. . .	. . .	0.60 (0.30, 1.21)	.15	. . .	. . .	. . .	. . .
Baseline housing situation								
Living alone	. . .	. . .	. . .	. . .	1.00		1.00	
Living with friends or relatives	. . .	. . .	. . .	. . .	0.71 (0.46, 1.10)	.12	0.68 (0.39, 1.17)	.16

Note. OR = odds ratio; CI = confidence interval; TANF = Temporary Assistance for Needy Families. Multivariate logistic regression was performed to obtain the best estimate of the relation between maternal health literacy and participation with a best subsets approach to arrive at final models separately for birth and 6 months of age. Analytic samples for TANF participation were 626 (of 744) at birth and 499 (of 744) at 6 months; for Food Stamp Program participation, samples were 590 (of 744) at birth and 472 (of 744) at 6 months. No significant differences were found in the distribution of demographic variables (infant birth weight, maternal age, maternal birth country, maternal education, maternal employment) between the analytic samples and the full cohort (data not shown). ORs present estimates for all predictors included in each of the 4 best models. Associations between explanatory variables were assessed to exclude multicollinearity. Although health literacy was related to maternal education, 38% of the mothers with inadequate health literacy had an education greater than high school. Although income and employment were significantly related ($P < .001$), they were not collinear, and both contributed to the model. All analyses were conducted with SAS (Version 9.1.3; SAS Institute Inc, Cary, NC).

educational attainment. Further research into solution-oriented approaches to these problems is warranted. ■

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Contributors

S. Pati led the conceptualization, design, and implementation of the study; wrote the brief; and revised subsequent drafts. Z. Mohamad and A. Cnaan conducted the analyses, helped implement the study, and helped write the draft of the brief. J. Kavanagh helped implement the study, helped interpret the results, and provided critical revision of the brief. J. A. Shea helped interpret the results and provided critical revision of the brief. All authors helped interpret findings and reviewed drafts of the brief.

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Human Participant Protection

All study activities were approved by the institutional review boards at the Children's Hospital of Philadelphia and the University of Pennsylvania. Participants provided written consent and were remunerated according to the study protocol.

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