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# Healthy Steps for Young Children: Sustained Results at 5.5 Years

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## ABSTRACT

**OBJECTIVE.** We sought to determine whether Healthy Steps for Young Children has sustained treatment effects at 5.5 years, given early findings demonstrating enhanced quality of care and improvements in selected parenting practices.

**METHODS.** Healthy Steps was a clinical trial that incorporated developmental specialists and enhanced developmental services into pediatric care in the first 3 years of life. A total of 5565 children were enrolled at birth and followed through 5.5 years. Healthy Steps was evaluated at 6 randomization and 9 quasi-experimental sites. Computer-assisted telephone interviews were conducted with mothers when Healthy Steps children were 5.5 years of age. Outcomes included experiences seeking care, parent response to child misbehavior, perception of child's behavior, and parenting practices to promote development and safety. Logistic regression was used to estimate overall effects of Healthy Steps, adjusting for site and baseline demographic characteristics.

**RESULTS.** A total of 3165 (56.9%) families responded to interviews (usual care:  $n = 1441$ ; Healthy Steps:  $n = 1724$ ). Families that had received Healthy Steps services were more satisfied with care (agreed that pediatrician/nurse practitioner provided support, 82.0% vs 79.0%; odds ratio: 1.25 [95% confidence interval: 1.02–1.53]) and more likely to receive needed anticipatory guidance (54.9% vs 49.2%; odds ratio: 1.33 [95% confidence interval: 1.13–1.57]) (all  $P < .05$ ). They also had increased odds of remaining at the original practice (65.1% vs 61.4%; odds ratio: 1.19 [95% confidence interval: 1.01–1.39]). Healthy Steps families reported reduced odds of using severe discipline (slap in face/spank with object, 10.1% vs 14.1%; odds ratio: 0.68 [95% confidence interval: 0.54–0.86]) and increased odds of often/almost always negotiating with their child (59.8% vs 56.3%; odds ratio: 1.20 [95% confidence interval: 1.03–1.39]). They had greater odds of reporting a clinical or borderline concern regarding their child's behavior (18.1% vs 14.8%; odds ratio: 1.35 [95% confidence interval: 1.10–1.64]) and their child reading books (59.4% vs 53.6%; odds ratio: 1.16 [95% confidence interval: 1.00–1.35]). There were no effects on safety practices.

**CONCLUSIONS.** Sustained treatment effects, albeit modest, are consistent with early findings. Universal, practice-based interventions can enhance quality of care for families with young children and can improve selected parenting practices beyond the duration of the intervention.

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### Key Words

randomized prospective trial, child development, parenting

### Abbreviations

HS—Healthy Steps for Young Children

OR—odds ratio

CI—confidence interval

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**I**N RECENT DECADES, there has been heightened interest in early interventions that have the “capacity to increase the odds of favorable developmental outcomes.”<sup>1</sup> Many such interventions are center- or home-based programs and are not linked directly to pediatric health care practices, although health care settings are a frequent point of contact with professionals for families with young children. In addition, many of the early intervention programs that have been shown to have positive treatment effects are resource intensive and target high-risk families, on the basis of socioeconomic status, childhood disabilities, parental substance use, or child maltreatment.<sup>1</sup>

In contrast, Healthy Steps for Young Children (HS) is a universal, practice-based intervention that enhances the delivery of behavioral and developmental services and relies on partnerships between developmental specialists and families.<sup>2,3</sup> The national evaluation was a 3-year, prospective, controlled trial with 6 randomization and 9 quasi-experimental pediatric sites. All families received standard pediatric care. Intervention families also received the HS program components, including contact with developmental specialists and 7 services: enhanced well-child care, up to 6 home visits in the first 3 years, a telephone line for nonemergency developmental concerns, developmental assessments, written materials, parent groups, and linkages to community resources.

HS services are offered to all families, regardless of their vulnerabilities. Evaluation results demonstrated both enhanced quality of care and promotion of more-favorable parenting practices related to perceptions of children’s behavior at 30 to 33 months, discipline at 30 to 33 months, and health care seeking at 2 to 4 months and 30 to 33 months.<sup>4-7</sup> In addition, HS reduced income disparities in the use of preventive services and enhanced parents’ satisfaction with care at 30 to 33 months.<sup>8</sup> Using observational data and a longitudinal sample, Caughy et al<sup>9</sup> reported that participation in HS was associated with positive child development outcomes, including greater attachment and fewer child behavior problems when children were 34 to 37 months of age.

The objective of this study was to assess whether HS, a 0- to 3-year intervention, has sustained or emergent treatment effects when children reach 5 to 5.5 years of age. Evaluations of sustained treatment effects for other, more-intensive, early childhood interventions have yielded mixed results, with variation being attributed to unevenness in both program quality and evaluation rigor.<sup>10,11</sup> Less-intensive interventions, such as the Comprehensive Child Development Program, have reported no effect during or after the intervention.<sup>12</sup> Intensive interventions with short-term effects seem to be more likely to demonstrate sustained benefits for children’s cognitive and social development and parenting behaviors.<sup>11</sup>

Long-term follow-up of selected early childhood interventions, including the High Scope/Perry Preschool Study,<sup>13</sup> the Brookline Early Education Project,<sup>14</sup> and the Chicago Child-Parent Center Program,<sup>15</sup> has demonstrated greater educational attainment, fewer arrests, and higher incomes into adulthood. These effects, which emerge after the intervention has ended, are known as “ sleeper effects.”<sup>16</sup> The presence of such findings supports the notion that early life experiences may affect behavior and functioning later in life, even in the absence of earlier detectable changes.<sup>17</sup>

Until recently, many evaluations of early childhood interventions were conducted in a single center<sup>18,19</sup> or community,<sup>14,15,20</sup> thus raising questions about replicability and generalizability to other settings. In addition, many early childhood interventions have focused on children at risk of poor health and behavior outcomes by virtue of family poverty or disability. McCormick et al<sup>21</sup> recently reported selected favorable results related to receptive vocabulary, math achievement, and risky behaviors from the intensive, multisite Infant Health and Development Program. We hypothesized that families exposed to HS would continue to report favorable parenting practices regarding their children’s behavior but would not experience differences in seeking health care for their children, because of changes in primary care providers and staff turnover. We anticipated the sustained effects regarding favorable parenting practices because of the fidelity to the intervention that was demonstrated across the study sites<sup>22</sup> and the theoretical underpinnings of the intervention, which intended to improve child outcomes by focusing on parent behaviors that support and nurture child development.<sup>3</sup>

## METHODS

### Study Population

HS was a 3-year, prospective, controlled trial with 6 randomization and 9 quasi-experimental pediatric sites, which were selected by program funders and were located in 14 states in the United States (randomization sites: Allentown, PA; Amarillo, TX; Florence, SC; Iowa City, IA; Pittsburgh, PA; San Diego, CA; quasi-experimental sites: Boston, MA; Chapel Hill, NC/Birmingham, AL; Chicago, IL; Detroit, MI; Grand Junction, CO/Monroterose, CO; Kansas City, KS; Kansas City, MO; New York, NY; Richmond, TX/Houston, TX). As reported previously in greater detail,<sup>3-5</sup> within each randomization site, newborns were assigned randomly, in blocks of 4, to intervention or control groups of ~200 newborns each, by using sealed envelopes provided to sites by the evaluation team. Constraints on sample size, space limitations, scheduling logistics, and the unwillingness of some practices to provide different services to families prevented randomization at all sites. At quasi-experimental sites, up to 200 newborns were enrolled consecutively at the

intervention sites and comparison sites matched with respect to organizational setting and demographic mixture of patients.

Enrollment of families occurred between September 1996 and November 1998. Consecutive newborns up to 4 weeks of age were enrolled at birth or their first office visit. Newborns were excluded if they were to be adopted or placed in foster care, they were too ill to make an office visit by 4 weeks, their mother did not speak English or Spanish, or the family intended to leave the practice within 6 months. At the time of the 5.5 year follow-up assessment, 2 of 6 randomization sites and 4 of 9 quasi-experimental sites continued to operate HS, targeted to children 0 to 3 years of age.

Since the most recent contact at 30 to 33 months, ongoing tracking of HS families has included mailing of annual birthday cards marked "return service requested" to inform evaluators of address changes; annual queries to the national change of address service to update contact information; and a newsletter marked "return service requested." All families that remained in the evaluation at 5 to 5.5 years were contacted for interviews.

#### Data Sources at 5.5 Years of Age

Computer-assisted telephone interviews were conducted in English or Spanish, at 61 to 66 months of age, by Battelle Centers for Public Health Research and Evaluation. Interviewers were trained by Battelle staff and the evaluation team and were blind to HS enrollment status. The mother was the primary respondent (98.7%). Respondents were asked about their responses to their child's misbehavior; perceptions about the child's health, behavior, development, and social skills; practices that promote child development and safety; and experiences seeking care for their children. Data on baseline demographic characteristics of families came from enrollment forms and parent telephone interviews conducted when children were 2 to 4 months of age.

#### Dependent Variables

Outcomes included parental responses to child misbehavior; reports of their child's health, behavior, development, and social skills; selected age-appropriate parenting practices that promote child health and development; and experiences seeking health care for their HS child. We created subscales to measure experiences seeking care. The internal consistency of the scales, as assessed with Cronbach's  $\alpha$ , exceeded .7 (the generally accepted lower limit for an internally consistent scale) for most scales.

Parents reported the frequency with which they used each of 12 responses to their child's misbehavior in an average week in the past month.<sup>23</sup> As in our previous study,<sup>5</sup> the usual 7-point scale was condensed to 4 response categories, ranging from 0 (never) to 3 (almost always), for telephone administration. Four variables

assessed parental responses to child misbehavior. First, a dichotomous variable indicated whether the parent ever slapped the child in the face or spanked him or her with an object. Second, a constructed scale ( $\alpha = .59$ ) included more harsh responses to misbehavior (eg, yelling in anger, threatening, slapping the child's hand, or spanking with a hand). The respondent's total score was summed and divided by the number of items and was interpreted in relation to the response categories for the items. One dichotomous variable indicated "harsh discipline" with a mean score of  $\geq 1.5$ . Third, 2 additional dichotomous variables, negotiating and ignoring, indicated whether nonphysical strategies were often or almost always used.

The child's overall health status was assessed on a 5-point Likert scale ranging from excellent to poor. The Foundation for Accountability screener identified children with special health care needs.<sup>24</sup> The Child Behavior Checklist for children 1.5 to 5 years of age measured parents' perceptions of their child's behavioral problems with regard to emotional reactivity, being anxious or depressed, sleep, attention, and aggression.<sup>25</sup> Parents rated their child regarding how true (often, sometimes, or never) each item was at the time of the interview. A dichotomous variable indicated the presence of borderline or clinical concerns, as described by Achenbach and Rescorla.<sup>25</sup> The Cronbach  $\alpha$  values for the syndrome scales were .69 for emotionally reactive, .69 for anxious/depressed, .70 for sleep problems, and .90 for the externalizing grouping.

The Parents' Evaluation of Developmental Status identified parental concerns regarding their child's development.<sup>26</sup> It consists of 10 items that elicit concerns about speech and language, motor development, behavior, social-emotional health, self-help skills, school skills, and global cognitive function.<sup>26</sup> A dichotomous variable indicated whether parents had significant concerns regarding their child's development. The Social Skills Rating System measured parents' perceptions of their child's social skills.<sup>27</sup> For each skill, parents reported how often (never, sometimes, or very often) the child engaged in the behavior described in each of 4 subscales: cooperation, assertion, responsibility, and self-control. The respondent's total score was summed. Cronbach's  $\alpha$  was .88 for the total score.

Four parenting practices assessed parents' promotion of their child's development and safety. Parents were asked whether, on weeknights during the school year, the child usually went to bed at about the same time each night or whether bedtime varied by  $>1$  hour from night to night. Parents also reported how often (never, once or twice per week, 3–6 times per week, or every day) the child looked at or read books outside of school in the past week. Responses were dichotomized as once or twice per week or more versus other. Parents were asked whether their child used a seat belt without a

booster seat most of the time, some of the time, or none of the time, and a dichotomous variable was created that indicated most of the time versus other. Finally, parents were asked how often in the past year the child wore a bicycle helmet, reported on a 5-point Likert scale from always to never; responses were dichotomized as always versus other.

Six variables reflected parents' experiences seeking medical care for their children (Table 1). Two questions from the Promoting Healthy Development Survey provided parents' report of whether they discussed 4 of 6 age-appropriate anticipatory guidance topics at the last well-child visit.<sup>28</sup> The first question indicated whether topics were discussed (the variable of "discussed 4 of 6 topics"). The second question provided preference-sensitive scoring and accounted for parents' perceived needs (the variable of "received anticipatory guidance and parenting education accounting for preferences").<sup>29</sup> Responses were categorized, from most to least favorable, as topic discussed and questions answered, topic not discussed and already had information, topic discussed and questions not answered completely, and topic not discussed and wish topic had been discussed. On the basis of the variable distribution, a dichotomous variable

indicated low and high quality at the midpoint of 20 (range: 6 to 24, with 24 being the highest quality).

A 5-item scale assessed the degree to which parents agreed that pediatricians or nurse practitioners provided support. Each item was rated on a 4-point Likert scale (strongly agree, agree, disagree, or strongly disagree), and responses were summed. A dichotomous variable indicated high quality as parents more than agreeing that support was provided. At 14 of 15 practices remaining in operation (1 practice closed during the second year of HS), parents reported whether their child remained at the original HS practice.

### Analyses

Families remained in their original group assignment regardless of the site of care, changes in pediatric practice, or continuation of the HS program at the site. Randomization and quasi-experimental sites were analyzed separately and combined. In bivariate analyses, we compared the distribution of parenting practices by using  $\chi^2$  statistics for categorical variables.

Logistic regression models were used to estimate the overall adjusted effects of HS. These models included site variables to account for the fact that families within sites tended to respond more similarly than did those at different sites. Baseline covariates included in the models were age of the child at the interview and characteristics of the mother (age, education, and race/ethnicity), family (number of siblings, owned home, and income), and infant (low birth weight and source of payment for care). Models for outcomes describing experiences seeking care (excluding remained at practice) also adjusted for whether the family remained at the original HS practice. The site variables and all covariates were simultaneously included in all models assessing HS effects. As in previous reports, the baseline covariates served as adjustments for potential differences between intervention and control families that resulted from nonrandom assignment at quasi-experimental sites or selective reporting of outcome data. Results of these adjusted analyses are reported as odds ratios (ORs) for all families as well as the randomization and quasi-experimental subgroups. All statistical procedures were performed using SAS 8.2 (SAS Institute, Cary, NC);  $P < .05$  was used to determine statistical significance.

The study was approved by the Johns Hopkins Committee on Human Research. Families gave written informed consent at the time of enrollment and oral consent for each parent interview.

### RESULTS

All 5565 families completed enrollment forms, 4896 (88%) completed 2- to 4-month interviews, and 3165 (57%) provided interview data at 5 to 5.5 years (Fig 1). The sample for analysis included the 3165 families with 5- to 5.5-year interview data. Among the 2393 families

**TABLE 1 Experiences Seeking Health Care at 5 to 5.5 Years**

Outcome	Item Content
Discussed 4 of 6 topics	Age-appropriate anticipatory guidance topics (food, bedtime, how getting along with other children, how follows directions, guidance and discipline, and reading) (6 items; Cronbach's $\alpha = 0.83$ )
Received anticipatory guidance and parenting education accounting for preferences	Age-appropriate anticipatory guidance topics (food, bedtime, how getting along with other children, how follows directions, guidance and discipline, reading), accounting for preferences (whether questions were answered, questions were not answered completely, respondent wished had talked about topic, or already had information about topic and did not need to talk about it) (6 items; Cronbach's $\alpha = 0.81$ )
Agreed that pediatrician/nurse practitioner provided support	Clinician helped parent get all information needed about child's growth and development, helped get services for child from other agencies and programs, gave advice on how to solve problems at home with child, gave new ideas about things to do with child, encouraged parent to ask questions about child's growth and development (5 items; Cronbach's $\alpha = 0.81$ )
Remained at practice	1 item
Used emergency department in past year for injury	1 item
Hospitalized in past year	1 item



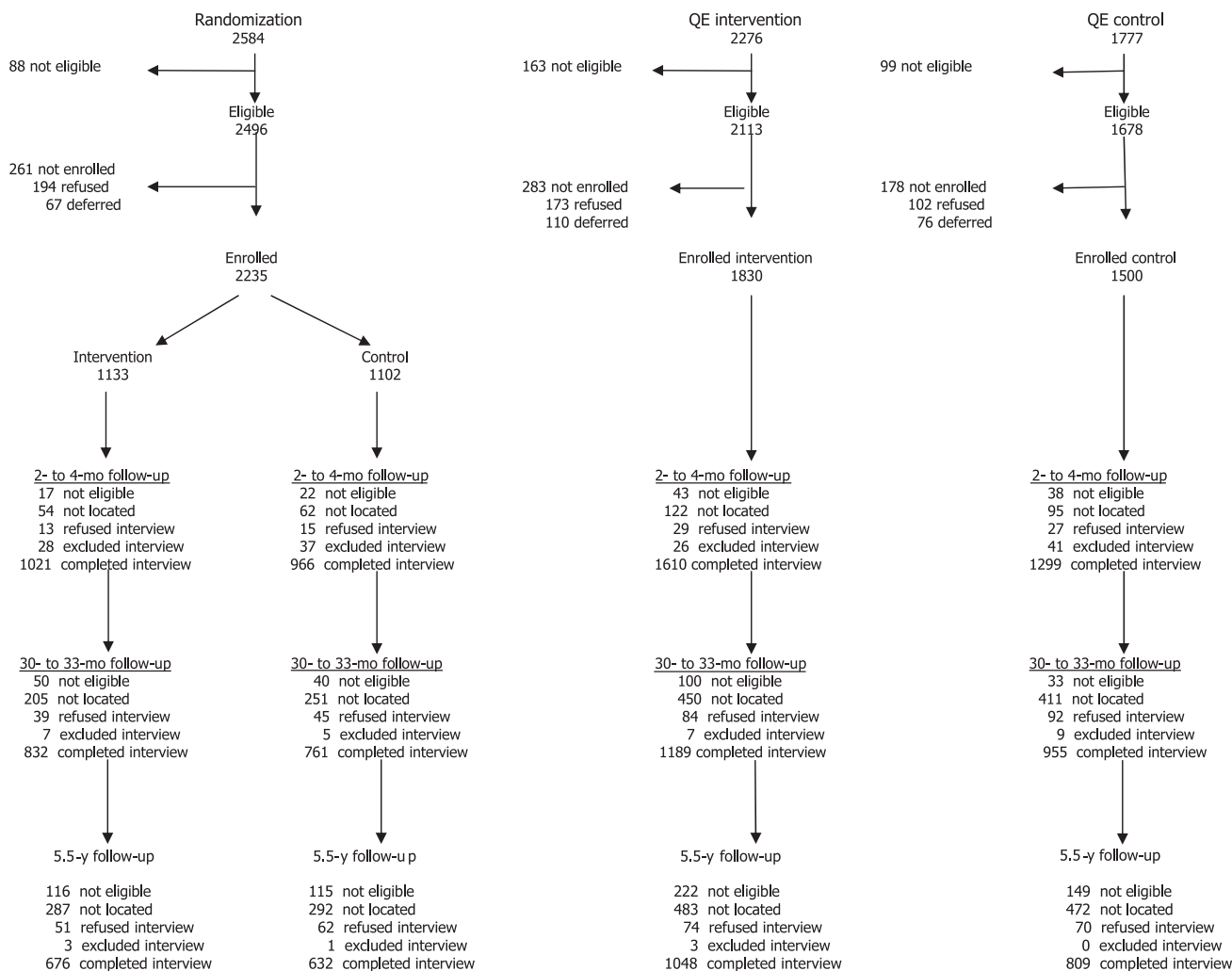


FIGURE 1 Participant flow through 5.5 years. QE indicates quasi-experimental.

that did not complete interviews, 602 (25.2%) were no longer eligible (eg, deceased, in foster care, withdrew from evaluation, or moved away), 1534 (64.1%) could not be located, and 257 (10.7%) declined interviews. Seven (<1%) were excluded for other reasons. Compared with nonresponders, the sample was more socioeconomically advantaged. More mothers in the sample were  $\geq 30$  years of age at birth, had graduated from high school, were white and non-Hispanic, were married, and had worked during the last month of pregnancy. However, there was no evidence of selective attrition according to whether the family had received the intervention; the percentages of nonresponders in the intervention and control groups were similar for mothers who were  $< 20$  years of age, who had less than high school education, and who were black, Hispanic, and not married (data available on request).

Among families interviewed at 5 to 5.5 years, greater percentages of intervention families than control families had completed college, were white non-Hispanic,

and had annual incomes of at least \$50 000 (Table 2). These differences were driven largely by differences observed at quasi-experimental sites at baseline. Families were comparable with regard to live birth order, child's birth weight, and child's age at the interview.

Overall, parental discipline practices were more favorable among intervention families than control families (Table 3). A smaller percentage of intervention families, compared with control families, ever slapped the child in the face or spanked him or her with an object (10.1% vs 14.1%;  $P < .001$ ), and greater proportions often or almost always negotiated with the child (59.8% vs 56.3%;  $P = .05$ ) and tended to often or almost always ignore misbehaviors (10.3% vs 8.5%;  $P = .08$ ). Although not always statistically significant, similar trends were observed at randomization and quasi-experimental sites. In adjusted analyses, intervention families had reduced odds of slapping or spanking and increased odds of negotiating at 5 to 5.5 years (Table 4). Responses to misbehavior were similar in magnitude and direction to

**TABLE 2** Baseline Sample Characteristics Among Respondents to the 5- to 5.5-Year Interview<sup>1</sup>

Characteristic	% (n)									
	Total			P	Randomization		P	Quasi-experimental		P
	All (N = 3165)	Intervention (N = 1724)	Control (N = 1441)		Intervention (N = 676)	Control (N = 632)		Intervention (N = 1048)	Control (N = 809)	
Mother's age, y				.10			.80			.01
<20	9.6 (303)	9.4 (162)	9.8 (141)		11.8 (80)	10.8 (68)		7.9 (82)	9.1 (73)	
20–29	48.4 (1529)	46.9 (806)	50.2 (723)		49.7 (336)	49.7 (314)		45.1 (470)	50.7 (409)	
≥30	42.0 (1326)	43.7 (751)	39.9 (575)		38.5 (260)	39.6 (250)		47.1 (491)	40.3 (325)	
Mother's education				<.001			.99			<.001
≤11 y	11.0 (348)	9.8 (167)	12.6 (181)		12.0 (81)	11.6 (73)		8.2 (86)	13.4 (108)	
High school graduate	24.7 (779)	23.8 (407)	25.8 (372)		27.6 (186)	27.1 (171)		21.3 (221)	24.9 (201)	
Some college or vocational school	29.8 (939)	29.0 (496)	30.8 (443)		30.7 (207)	31.3 (198)		27.8 (289)	30.3 (245)	
College graduate	34.5 (1087)	37.5 (643)	30.8 (444)		29.8 (201)	30.1 (190)		42.6 (442)	31.4 (254)	
Mother's race				<.001			.40			<.001
White	64.8 (2030)	67.5 (1150)	61.1 (880)		68.5 (456)	67.3 (421)		66.9 (694)	57.0 (459)	
Black	21.1 (662)	20.3 (345)	22.0 (317)		21.2 (141)	19.5 (122)		19.7 (204)	24.2 (195)	
Asian/Native American	4.5 (140)	4.6 (78)	4.3 (962)		4.1 (27)	4.8 (30)		4.9 (51)	4.0 (32)	
Other	9.6 (302)	7.6 (130)	11.9 (172)		6.3 (42)	8.5 (53)		8.5 (88)	14.8 (119)	
Mother's ethnicity, Hispanic	16.3 (515)	14.1 (243)	18.9 (272)	<.001	14.8 (100)	17.9 (113)	.13	13.7 (143)	19.7 (159)	<.001
Live birth order, first	45.7 (1446)	46.8 (806)	44.4 (640)	.19	46.6 (315)	43.5 (275)	.26	46.9 (491)	45.1 (365)	.46
Child's insurance, Medicaid	33.1 (987)	32.2 (527)	34.3 (460)	.22	37.6 (243)	33.5 (198)	.13	28.6 (284)	34.9 (262)	.01
Child's birth weight <2500 g	6.4 (199)	6.8 (115)	5.9 (84)	.33	8.0 (53)	6.6 (41)	.35	6.0 (62)	5.4 (43)	.57
Income at baseline				<.001			.22			<.001
Low (less than \$20 000)	24.8 (740)	21.9 (358)	28.4 (382)		29.1 (188)	27.9 (165)		17.1 (170)	28.7 (217)	
Middle	36.4 (1085)	35.4 (579)	37.6 (506)		35.8 (231)	40.4 (239)		35.1 (348)	35.3 (267)	
High (at least \$50 000)	38.9 (1160)	42.8 (701)	34.1 (459)		35.1 (227)	31.6 (187)		47.8 (474)	36.0 (272)	
Owned home	59.8 (1782)	60.6 (992)	58.7 (790)	.28	60.6 (390)	63.6 (376)	.27	60.7 (602)	54.8 (414)	.01
Child's age at interview, mo				.36			.01			.83
61	5.4 (170)	6.0 (104)	4.6 (66)		7.0 (47)	3.2 (20)		5.4 (57)	5.7 (46)	
62	58.4 (1849)	58.9 (1015)	57.8 (834)		56.1 (379)	54.0 (341)		60.7 (636)	60.9 (493)	
63	18.8 (594)	18.4 (317)	19.2 (277)		17.5 (118)	22.3 (141)		19.0 (199)	16.8 (136)	
64	9.3 (293)	9.2 (158)	9.4 (135)		10.4 (70)	9.3 (59)		8.4 (88)	9.4 (76)	
65	6.6 (209)	6.1 (105)	7.2 (104)		6.8 (46)	8.4 (53)		5.6 (59)	6.3 (51)	
66	1.6 (50)	1.5 (25)	1.7 (25)		2.4 (16)	2.9 (18)		0.9 (9)	0.9 (7)	

Data for up to 2% of respondents may be missing for the variables, except insurance (6%), income (6%), and owned own home (6%). Valid percentages reported.

those observed at 30 to 33 months,<sup>5</sup> although there were no significant differences in the use of harsh discipline (7.5% vs 7.3%;  $P = .73$ ) or ignoring misbehavior at 5 to 5.5 years (10.3% vs 8.5%;  $P = .08$ ).

The children overall were healthy (86.5% with very good or excellent health), and 15.3% had special health care needs, with no differences according to treatment group. Consistent with earlier findings, the mean scores for mothers' responses on the Child Behavior Checklist (externalizing and each syndrome) were comparable to those for nonreferred children reported by Achenbach and Rescorla,<sup>25</sup> which indicated that levels of behavioral problems for HS children were similar to those for generally healthy children. Mothers in the intervention group had increased reporting of borderline or clinical behavioral concerns (18.1% vs 14.8%;  $P = .01$ ; OR: 1.35; 95% confidence interval [CI]: 1.10–1.64) (Table 3); these results were comparable to results at 30 to 33 months (Table 4).

Overall, 22% of parents had ≥1 significant concern regarding their child's development, and their perceptions

of their child's social skills were comparable to means reported for a normative sample of kindergarteners.<sup>27</sup> There were no differences with regard to developmental concerns, perceived social skills, or having a regular bedtime between the intervention and control families.

In bivariate analyses, intervention parents had more-favorable practices with regard to encouraging their child to read and using appropriate car seat restraints. Findings at randomization and quasi-experimental sites were observed in the same direction. Among the child development practices assessed at 5 to 5.5 years, more intervention families reported that their child looked at or read books in the past week (59.4% vs 53.6%;  $P < .001$ ); these results had borderline significance in adjusted analyses (OR: 1.16; 95% CI: 1.00–1.35).

Intervention families at 5.5 years continued to report more-favorable experiences seeking health care for their children than did control families. More intervention families received anticipatory guidance that matched their preferences (54.9% vs 49.2%;  $P < .01$ ; OR: 1.33; 95% CI: 1.13–1.56), agreed that the pediatrician or

**TABLE 3 Parenting Outcomes at 5 to 5.5 Years**

Outcome	Total			P	Randomization		P	Quasi-experimental		P
	All (N = 3165)	Intervention (N = 1724)	Control (N = 1441)		Intervention (N = 676)	Control (N = 632)		Intervention (N = 1048)	Control (N = 809)	
Parental response to misbehavior, % (n)										
Ever slap in face/spank with object	11.9 (369)	10.1 (170)	14.1 (199)	<.001	11.2 (74)	12.7 (79)	.40	9.3 (96)	15.1 (120)	<.001
Use harsh discipline	7.3 (225)	7.5 (120)	7.3 (105)	.73	5.3 (35)	6.5 (40)	.39	8.3 (85)	8.2 (65)	.97
Often/almost always negotiate	58.2 (1803)	59.8 (1008)	56.3 (795)	.05	58.9 (389)	54.3 (337)	.09	60.3 (619)	57.8 (458)	.29
Often/almost always ignore misbehavior	9.5 (294)	10.3 (174)	8.5 (120)	.08	9.4 (62)	8.9 (55)	.75	10.9 (112)	8.2 (65)	.05
Child's behavior, development, and social skills										
Clinical/borderline concern regarding child's behavior (CBCL), % (n)	16.6 (508)	18.1 (303)	14.8 (205)	.01	20.2 (132)	16.5 (100)	.09	16.8 (171)	13.4 (105)	.05
Significant concern regarding child's development (PEDS), % (n)	21.8 (691)	21.6 (373)	22.1 (318)	.77	20.4 (138)	21.7 (137)	.48	22.4 (235)	22.4 (181)	.98
Child's social skills (SSRS), mean ± SD	56.1 ± 9.6	56.3 ± 9.5	56.0 ± 9.8	.40	55.9 ± 9.8	55.2 ± 10.0	.23	56.5 ± 9.2	56.6 ± 9.4	.93
Promotion of child development and safety, % (n)										
Routine/regular bedtime	86.9 (2720)	87.7 (1497)	86.0 (1223)	.16	85.1 (570)	87.7 (547)	.18	89.4 (927)	84.7 (676)	<.01
Looked at/read books in past week	56.8 (1780)	59.4 (1016)	53.6 (764)	<.001	59.3 (398)	56.7 (354)	.35	59.4 (618)	51.2 (410)	<.001
Seat belt without booster most of time	45.0 (1409)	43.0 (734)	47.4 (675)	.01	42.3 (282)	44.6 (278)	.37	43.6 (452)	49.6 (397)	.01
Always wears bike helmet	56.6 (1590)	57.1 (872)	55.9 (718)	.50	56.6 (333)	57.0 (322)	.63	58.1 (539)	55.0 (396)	.20
Experiences seeking care, % (n)										
Discussed 4 of 6 topics	46.4 (1340)	48.7 (763)	43.8 (577)	<.01	53.7 (335)	48.9 (278)	.10	45.4 (428)	39.9 (299)	.02
Received anticipatory guidance and parenting education accounting for preferences	52.3 (1494)	54.9 (852)	49.2 (642)	<.01	59.3 (366)	53.7 (302)	.05	51.9 (486)	45.8 (340)	.01
Agreed that pediatrician/nurse practitioner provided support	80.6 (2284)	82.0 (1262)	79.0 (1022)	.04	82.5 (498)	80.3 (464)	.33	81.7 (764)	77.9 (558)	.06
Remained at practice	63.4 (1800)	65.1 (1066)	61.4 (794)	.04	67.1 (433)	64.8 (390)	.38	63.6 (573)	58.4 (404)	.03
Used emergency department in past year for injury	9.7 (297)	9.6 (161)	9.8 (136)	.90	9.2 (60)	10.0 (61)	.61	9.9 (101)	9.6 (75)	.81
Hospitalized in past year	3.0 (92)	3.2 (45)	2.8 (47)	.50	3.2 (21)	3.5 (21)	.81	2.6 (26)	3.1 (24)	.51

CBCL indicates Child Behavior Checklist; PEDS, Parents' Evaluation of Developmental Status; SSRS, Social Skills Rating System.

nurse practitioner provided support (82.0% vs 79.0%;  $P = .04$ ; OR: 1.25; 95% CI: 1.02–1.53), and ultimately remained at the HS practice (65.1% vs 61.4%;  $P = .04$ ; OR: 1.19; 95% CI: 1.01–1.39). There were no differences in emergency department use or hospitalizations.

## DISCUSSION

In this evaluation of a 0- to 3-year intervention based in pediatric practices, we report sustained program effects with regard to experiences seeking health care, parents' responses to their child's misbehavior, encouragement of daily reading, and perceptions of their child's behavior. Each of these effects may contribute to children's optimal development and well-being, as well as more effective parenting. This evaluation demonstrates that a universal, practice-based intervention can enhance parenting outcomes that are critical to children's development and that these effects, although small in magnitude, persist beyond the duration of the intervention. HS was designed for all families, regardless of their risk for developmental and behavioral problems, with the recognition that all families desire to know more about how best to raise their children.

Although treatment effects for several outcomes were small in magnitude, as reported previously, HS was modest in intensity and cost, relative to other early intervention efforts.<sup>5</sup> For example, HS families made 11 well-child visits and received <2 home visits within their child's first 2.5 years, at a cost of \$402 to \$933/year. In contrast, Head Start was a center-based program (\$4500/year), and the Infant Health and Development Program, at \$10 000/year, provided an average of 67 home visits in children's first 3 years of life. Determination of the full cost-effectiveness of HS requires assessment of outcomes into young adulthood.

The HS findings are consistent with the magnitude and direction of those observed at 30 to 33 months, when robust effects were observed for quality of health care services received and parenting practices related to discipline and perceptions of behavior.<sup>5</sup> The persistence of these findings is related to experiences seeking health care in an intervention that offered the greatest intensity of services in the first 18 months, with completion of home visits particularly concentrated in the child's first year. HS families, like all families, experienced changes in employment, geographic moves, and changes in



**TABLE 4 Parenting Outcomes Over Time**

Outcome	Adjusted OR (95% CI)				
	2–4 mo, Total	30–33 mo, Total	5–5.5 y		
			Total	Randomization	Quasi-experimental
Parental response to misbehavior					
Ever slap in face/spank with object	—	0.73 (0.55–0.97)	0.68 (0.54–0.86)	0.85 (0.60–1.22)	0.57 (0.54–0.86)
Use harsh discipline	—	0.78 (0.62–0.99)	0.98 (0.74–1.30)	0.78 (0.48–1.26)	1.12 (0.78–1.60)
Often/almost always negotiate	—	1.16 (1.01–1.34)	1.20 (1.03–1.39)	1.25 (0.99–1.56)	1.16 (0.95–1.42)
Often/almost always ignore misbehavior	—	1.38 (1.10–1.73)	1.24 (0.97–1.59)	1.07 (0.73–1.58)	1.32 (0.95–1.84)
Child's behavior					
Clinical or borderline concern regarding child's behavior <sup>a</sup>	—	1.26 (1.01–1.57)	1.35 (1.10–1.64)	1.26 (0.94–1.69)	1.48 (1.12–1.95)
Promotion of child development					
Followed routines <sup>b</sup>	1.00 (0.88–1.13)	1.03 (0.88–1.20)	1.02 (0.82–1.26)	0.76 (0.55–1.06)	1.24 (0.93–1.67)
Showed/looked at or read picture books <sup>c</sup>	1.22 (1.07–1.40)	0.96 (0.82–1.12)	1.16 (1.00–1.35)	1.07 (0.85–1.35)	1.22 (1.00–1.48)
Experiences seeking care					
Discussed topics <sup>d</sup>	2.41 (2.10–2.75)	10.36 (8.51–12.6)	1.33 (1.13–1.56)	1.24 (0.98–1.58)	1.42 (1.14–1.78)
Received anticipatory guidance and parenting education accounting for preferences	—	—	1.33 (1.13–1.57)	1.28 (1.01–1.64)	1.38 (1.11–1.73)
Agreed that pediatrician/nurse practitioner provided support <sup>e</sup>	2.33 (1.82–3.03)	2.70 (2.17–3.45)	1.25 (1.02–1.53)	1.13 (0.83–1.54)	1.31 (1.00–1.73)
Remained at practice	—	1.66 (1.47–1.87)	1.19 (1.01–1.39)	1.10 (0.86–1.41)	1.30 (1.05–1.61)
Used emergency department in past year for injury	—	0.77 (0.61–0.97)	1.00 (0.83–1.20)	0.96 (0.73–1.27)	1.01 (0.79–1.30)
Hospitalized in past year	—	1.14 (0.84–1.54)	0.90 (0.57–1.42)	0.96 (0.51–1.79)	0.84 (0.43–1.66)

<sup>a</sup> Any clinical or borderline concern regarding the child's behavior, assessed by using the following Child Behavior Checklist syndrome scales: anxious/depressed, sleep problems, and aggressive behavior (30–33 months) or emotionally reactive, anxious/depressed, sleep problems, and attention problems (5–5.5 years).

<sup>b</sup> Followed ≥2 routines (2–4 months), followed 3 routines (30–33 months), or regular bedtime (5–5.5 years).

<sup>c</sup> Showed picture books ≥1 time daily (2–4 months), read or showed picture books every day or more (30–33 months), or looked at or read books in past week (5–5.5 years).

<sup>d</sup> Discussed 5 of 6 topics (2–4 months), discussed ≥7 of 10 topics (30–33 months), or discussed ≥4 of 6 topics (5–5.5 years).

<sup>e</sup> Suggested things parent could do for child that fit into family's daily life (2–4 and 30–33 months), helped get needed information about child's growth and development, helped get services for child from other agencies and programs, gave advice on how to solve problems at home with child, gave new ideas about things to do with child, and encouraged parents to ask questions about child's growth and development (5–5.5 years), pointed out what parents do well (2–4 months and 30–33 months), acted like parents understand information (2–4 months), and made parents feel like they are doing a good job (2–4 months).

health care providers, and HS practices underwent changes in staffing and reimbursement. Our findings suggest that quality of care might have contributed to enhanced practice retention, whereas, among those who changed practices, parental expectations for care might have led to seeking sites that emphasized behavior, development, and communication between providers and families. In contrast, a randomized, controlled trial of a practice-based quality improvement initiative in North Carolina led to small changes in receipt of anticipatory guidance (only 18% of parents of 6-month-old children in the intervention group discussed all 4 anticipatory guidance topics) and no changes in parent behaviors.<sup>30</sup>

Although the exact measures differed, the absolute difference in the proportions of parents who reported ever slapping in the face or spanking with an object (overall: 4%; randomization: 2%; quasi-experimental: 6%) was consistent with the 7% difference in the proportions of parents who reported spanking their child in the past week in the Early Head Start evaluation.<sup>31</sup> The HS effect is noticeable, given the overall lower reports of corporal punishment (14% in the HS control group, compared with 54% in the Early Head Start control group). The modest but sustained HS effect regarding more favorable responses to the child's misbehavior is

important because corporal punishment has been associated with aggressive behavior and other antisocial behaviors in children<sup>32</sup> and family management difficulties.<sup>33</sup> Aggressive behavior in early childhood, in turn, is a risk factor for additional aggression, rejection by peers, substance use, delinquency, and poor school performance.<sup>34</sup> In contrast, nonpunitive approaches to discipline support parent-child relationships and encourage more favorable child behaviors.<sup>35</sup>

The positive results related to reading at 5.5 years are consistent with evaluations of Reach Out and Read,<sup>36–38</sup> a component needed activity of HS, and with the Early Head Start evaluation.<sup>31</sup> In HS, similar findings were present at 2 to 4 months but not at 30 to 33 months, perhaps attenuated by the adoption of Reach Out and Read at some control sites during the intervention. It is difficult to compare the magnitude of reading outcomes in HS with those obtained in previous evaluations of 2- to 3-year-old children (Early Head Start and Reach Out and Read), most of whom are not reading books on their own outside of school. Relative to the Reach Out and Read evaluation, there was a smaller increase in the proportion of HS intervention families versus control families that reported favorable reading activities (54% vs 59% of HS children looked at/read books at least once per

week outside of school; 46% vs 78% of Reach Out and Read families read to their child  $\geq 3$  days each week). Reading results for HS children were comparable to those observed in Early Head Start, in which 52% of control families and 57% of intervention families read to their child daily. Although the HS intervention was not narrowly focused on achievement of school readiness, parental support of reading is widely recognized to be associated with language development and later reading success in elementary school.

At 5.5 years, intervention mothers continued to be more likely to report having clinical or borderline concerns regarding their child's behavior. We believe that more frequent discussions regarding their child's development and behavior led to increased sensitivity to understanding their child's behavior. We do not have external validation of parents' perceptions of children's behavior at 5 to 5.5 years.

The lack of findings with regard to developmental milestones and safety practices is consistent with 30- to 33-month findings and may reflect ceiling effects, with 97% of children identifying colors, 95% writing their first name, and 95% holding the pencil properly. Corresponding percentages in a national sample of kindergarteners were 78%, 50%, and 91%, respectively (C. Chapman, MA, verbal communication, 2006). HS children had social skills comparable to those reported for the normative sample of children,<sup>27</sup> and no treatment effects were found. With regard to safety practices, 81% of HS children knew an emergency telephone number, and 70% used sunscreen most of the time.

No emergent program effects were observed. As in the 30- to 33-month evaluation, there were no differences in overall use of acute health care services. Proportions of HS children with ED visits and hospitalizations in the past year were comparable to national data (with 3% of HS children hospitalized in the past year vs 5.9% of children 0–4 years of age and 1.6% of children 5–9 years of age nationally<sup>39</sup> and 23% of HS children with ED visits vs 27% of children <6 years of age nationally<sup>40</sup>).

Several limitations should be noted. First, we relied on parental reports for children's behavior and social skills. The cost of direct assessments for the full sample, now dispersed over many sites beyond the original 24 practices and 15 sites (given family mobility), would have been prohibitive. Similarly, we chose not to obtain teacher, caregiver, and preschool provider reports, given variability in the settings in which 5.5-year-old children receive care and pragmatic considerations of locating additional respondents. For example, at the time of the 5.5-year interview or in the preceding year, 51% of children attended preschool, 35% attended kindergarten, 15% received before-school child care, and 29% received after-school child care. The HS instruments, nevertheless, have high reliability and validity and have

been shown to be consistent with assessments by teachers<sup>20,22</sup> and health professionals.<sup>20,21</sup>

Second, the study was limited by sample attrition. Although 57% of those enrolled participated in the 5.5-year evaluation, this participation rate is consistent with those of other evaluations<sup>13</sup>; only 7.5% of eligible subjects who were contacted declined interviews (257 of 3422 subjects), and we observed no selective attrition according to intervention status. Third, the sites participating in this clinical trial were thought to deliver high-quality pediatric care and had the capacity to participate in a clinical trial. Therefore, these sites may not be comparable to all pediatric practices.

The evaluation included both randomization and quasi-experimental designs. Although randomization design reduces selection bias, it introduces possible spillover effects. The quasi-experimental design reduces spillover effects but does not eliminate the possibility of selection bias.<sup>41,42</sup> The use of prospectively identified control subjects was intended to minimize discrepancies in outcomes between the 2 designs.<sup>43</sup> For some outcomes, as noted previously, the magnitude and direction of outcomes for intervention and control families at randomization and quasi-experimental sites were comparable, although they were statistically significant only at quasi-experimental sites and in the larger pooled sample. The more-limited power at randomization sites (6 sites vs 9 sites) may partially explain these findings.

## CONCLUSIONS

These findings demonstrate that a universal practice-based intervention can have sustained effects on experiences seeking health care and other parenting behaviors that are critical to children's development. Pediatric practices are viable settings for providing enhanced behavioral and developmental services as part of an integrated service delivery system. In HS, the incorporation of new health professionals into pediatric care facilitates the expansion of services and strengthens ties between families and practices. The HS model has been adapted and now operates in 45 practices in 18 states (M. Barth, PhD, written communication, 2006). Because the program was initially implemented as a demonstration program, original sites that did not sustain the program confronted challenges in financial support and reimbursement.<sup>22</sup>

Incorporating developmental specialists into pediatric practices seems to be an effective strategy to meet families' needs regarding their children's behavior and development. Ongoing efforts are needed to determine whether these treatment effects are sustained and whether sleeper effects emerge.

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