The Effect of Smart Start Health Interventions on Children's Health and Access to Care

FPG UNC-CH Smart Start Evaluation Team
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INTRODUCTION

North Carolina's Early Childhood Initiative (Smart Start) was created in 1993 as a partnership among state government and local leaders, service providers, and parents to better serve children under six and their families. The state distributes funds to county Partnerships for Children, non-profit corporations established specifically for the purpose of administering Smart Start activities. Smart Start programs and services provide access for children under age six to high-quality and affordable child care, health care, and other critical family services. The primary goal of Smart Start is to ensure that all children enter school healthy and prepared to succeed.[1]

The purpose of the present study is to determine if Smart Start Health Interventions have any measurable effect on children's health status and access to health care. If the hypothesis that Smart Start Health Interventions can improve children's health and their access to health care is correct, then it should be possible to detect answers to the following two research questions:

1. Is participation in Smart Start Health Interventions associated with practitioners' reports of children's health status and parents' reports of where their children obtain regular health care, and
2. Is longer exposure to Smart Start Health Interventions associated with improved children's health status as reported by practitioners and with parents' reports of where their children obtain regular health care?

Smart Start and Health Services

The rationale for Smart Start health improvement activities in North Carolina is that preventive and primary health care services such as immunizations, well child visits and health screenings may improve children's health and physical abilities, enhance access to a nutritious diet, and improve a family's use of preventive and curative health care.[2] Because the primary goal of Smart Start is to ensure that all young children enter school healthy and prepared to succeed, local Smart Start services often include programs to insure access to comprehensive primary and preventive health, mental health, and dental services, although on average only 10% of local partnership funds are allocated to health services.[3] The majority of Smart Start direct service funds are legislatively mandated to be spent on child care-related services including direct child care subsidies, quality improvement, and teacher education and support. Because of Smart Start's focus on child care, Smart Start health interventions are often offered in the context of child care programs.

With the implementation of Smart Start efforts in North Carolina, there have been numerous improvements on behalf of children's health. For example, before Smart Start began in Jones County, the county had no pediatrician, whereas now a pediatrician is available.[4] In Catawba County, dental screening was made available through Smart Start for children in every child care center. Of the children who received the screening, 82% had never been to a dentist. More than 5,000 children in Cumberland County have received vision, dental and hearing screenings at their child care centers which they may not have gotten otherwise.[4] In addition to health screenings, dental care, and preventive and primary health care services, other examples of Smart Start Health Interventions include access to mental health care, nutrition services in child care centers, immunizations, parental health education, and health promotion, injury prevention, and infectious disease control in out-of-home child care settings.[1]

BENEFITS OF CHILD HEALTH INTERVENTIONS

Several recent studies have shown the benefits of a variety of health interventions for young children in out-of-home care, particularly those in poverty. While Smart Start seeks to improve services for all children under kindergarten age, it borrows from the experience of programs such as Head Start, which target a particular population of at-risk children. Public health physicians and pediatricians emphasized the need for a health component of Head Start, because data showed that the prevalence of tuberculosis, rheumatic fever, and physical and mental handicaps, as well as of untreated chronic disabilities, was greater among children in low-income groups than among those with middle or upper level incomes.[5] Immunizations were also far less adequate in lower income groups than in the upper- and middle-income groups. Research suggests that inadequate health and inadequate nutrition can compromise physical, mental, and social development.[6]

Research into Head Start health interventions has demonstrated the importance of comprehensive health service programs in preparing preschoolers for school success.[7] Data have shown fewer cases of anemia, more immunizations, better nutrition practices, and generally better health status among Head Start participants than among matched controls.[8] Head Start programs also have been effective in identifying children with asthma, resulting in timely and proper treatment and the prevention of hospitalization and repeated use of expensive medical services.[9]

The Southern Regional Education Board (SREB), in its Educational Benchmarks 2000 series, reported that 13 SREB states have early childhood immunization rates that are as good or better than the national average. The SREB attributes this improvement in Southern states' immunization rates to state-run programs such as Smart Start, citing that such programs reach underserved children not reached by Head Start with services such as expanded immunization programs. Referral to health services available through quality child care facilities would be inaccessible to the children of the working poor without programs such as Smart Start. Such families would have no choice but to attend lower quality child care because they do not qualify for the state child care subsidies available for families living under the poverty line.[6]

African-American children have consistently been found to be at risk of inadequate access to health care and immunization services when compared to Whites. African Americans are more likely than Whites to contract a serious illness, but less likely to have private health insurance or access to health care providers.[10] A study by Kenyon et al. found that African American preschool children were less likely to be immunized compared to White preschool children (36% vs. 53%).[11] This puts African American children at greater risk of getting diseases preventable by immunizations. For example, in Chicago during 1989, of the 2232 measles cases reported, 75% were in children under age 5 years, and 71% were in African American children.[11] One study found that African American children, particularly boys, were more likely to have a serious hearing impairment than White children of similar ages.[12] Results from an earlier study suggested that Smart Start has a positive effect in terms of improved access to a regular source of health care for African American children in North Carolina.[13]

PREVIOUS SMART START HEALTH STUDIES

The Kindergarten Health Assessment (KHA) project of the FPG-UNC Smart Start Evaluation Team was designed to use the mandated health screening form required of all North Carolina kindergartners as a way to document the health status of children in selected Smart Start counties. The initial KHA study was undertaken in 1995 to establish baseline health information in participating counties. A total of 514 schools were selected to participate in the study, and data were collected from 9,412 kindergartners representing 47,474 kindergarten children across the state. The results from this study indicated that approximately 25 percent of North Carolina kindergartners had at least one health problem. Between 6 and 7 percent of children failed vision screenings, and approximately 2 percent of children failed hearing screenings.[14] Data from the original KHA study also showed that although most North Carolina kindergartners were fully immunized once they entered kindergarten, only 53.3% had been immunized on time as specified by North Carolina immunization requirements. Many children received their immunizations just before entry into school. A major limitation of this study was the quantity of missing data - questions on the form that were not answered by the health professional. For example, 46 percent of children had missing data for vision screening.[14]

The second KHA study was a part of the six county Kindergarten Entry Skills Study, which examined the effects of Smart Start-supported child care on the skills of children at school entry.[15] Results showed that Smart Start children as a whole were more likely to have a regular source of health care such as a private doctor, a health department or a community health center, whereas non-Smart Start children were more likely to use an emergency department or "other" place as their regular source of care. Missing data continued to be a problem for this study. The sample size (n=508) limited statistical power and made it impossible to analyze subgroups. Finally, the study was designed originally to elicit kindergarten entry skills data, not health data.[13]

The current study overcame some of the limitations of previous Smart Start health studies by focusing on county partnerships that had implemented substantial Smart Start health interventions. Specific details about the study are presented in the following section.

METHODOLOGY

Participating Partnerships

Eleven counties in ten Smart Start partnerships from across the state were selected on the basis of round (year the county established its partnership), region of the state, and their Smart Start-funded Health Interventions. Five of the six "early" round counties (three from round 1 and two from round 2) were matched with five "late" round counties (four from round 3 and one from round 5) to answer the second research question, whether health differences existed among Smart Start children according to length of exposure to Smart Start Health Interventions. Round 1 partnerships would have begun providing services during Smart Start's first year, 1993-94. The round 5 county established its Smart Start partnership as the present study began in 1997-98.

Participating Children

After discussing the project with Smart Start (SS) Executive Directors in the participating counties, the superintendents or other leaders in the various school districts of each county were contacted and asked to help the project gain access to the school records of two groups of kindergarten children who entered school in fall 1998: those who received a SS-funded health service (intervention group) and those who had not (controls). Each county was asked to provide Kindergarten Health Assessment (KHA) information on 25 children from each group. The SS sample was drawn at random from a list provided by each partnership of kindergartners who had received any SS-funded health service(s). The control sample was drawn at random from alphabetized class lists, matching on eligibility for free or reduced price lunch (FRPL), an indicator of poverty.

In some cases a county was not able to provide KHA data on as many as 25 pairs of children, and in other cases the county provided us with data on slightly more than 25 pairs of children. One county submitted data on 900 children because SS staff in that county wanted a sample large enough to test for significance. When all possible subjects were used in regression analyses, county was controlled for to prevent this county from biasing the results.

Data Collection

Partnerships recommended persons who could carry out the data collection in their counties, typically school system or partnership employees who wanted additional part-time work. Training sessions on data collection guidelines and techniques were provided for all 20 data collectors. The number of data collectors per county ranged from 1 to 3.

The Kindergarten Health Assessment (KHA) form (Appendix A) was used as the primary source of data on health indicators for the children. This form documents the medical history and physical examination required for all children entering public kindergarten in North Carolina. The data gathered from the KHA form included only the 17 short answer or multiple-choice responses, but none of the opened-ended items. Data collectors were instructed to collect data only from a KHA form with the exception of immunization data, which could be obtained also from a separate health record or immunization card. In two counties with a substantial military presence, equivalent military health forms with comparable data were accepted. Data collection took place between fall 1998 and early winter 1999. The data coding sheet was developed by the evaluators (Appendix B).

Three types of data were collected: 1) personal, 2) health assessment, and 3) immunization. The personal data section included information such as birth date, sex, race, ethnicity (Hispanic or not), and place where the child received regular health care. No personally identifying information, such as children's names, were copied onto the data sheet. All personal data were reported by the child's parent or guardian. The health assessment section included items such as weight, height, blood pressure, vision, hearing, development, hematocrit/hemoglobin, and illnesses or developmental problems, and was completed by the health provider. The illnesses or developmental problems item listed 24 options ranging from asthma to dental problems and speech problems. The health provider was instructed to mark as many as the child currently had. Among the 24 were spaces to note if a child had "Other (specify)" or "None" (no) illnesses. The immunization section provided blank boxes for every shot required in each immunization series. The provider was expected to fill in the date of each immunization in the order administered.

Project staff entered the data from the coding sheets. There were range and consistency checks for the entire data set, and 10% of the output was selected randomly for complete data verification.

Definitions of Variables

Smart Start-funded Health Interventions. The independent variable of interest in this study is whether a child received a Smart Start (SS)-funded Health Intervention. Examples of SS-funded health-related activities in several of the participating counties are listed in Table 1. One partnership employee described SS-funded health interventions as "filling in missing pieces of a puzzle." Health care providers in the counties whose services are enhanced by Smart Start dollars point out that populations that often go underserved or "fall through the cracks" have especially benefited. These groups include children in the migrant community, families whose income falls just above State Child Health Insurance Program (SCHIP) eligibility requirements, or families in which one or more sources of their income have been terminated.

Table 1. Smart Start Funded Health Activities, 1998-1999.

Early Smart Start Counties
▪ Provision of a mid-level Health Practitioner ▪ Preventive Dental Care Program ▪ Dental Treatment ▪ Purchase of equipment and supplies necessary for Vision Screening ▪ Support for the Mobile Health Unit providing outreach and treatment ▪ Childcare Outreach Nurses ▪ Early Intervention Teams ▪ Vision Screening – Prevent Blindness of NC ▪ In-Home Visitation ▪ Health Care Coordination
Late Smart Start Counties
▪ Nursing Education and Technical Assistance ▪ Community Transition Coordinator (for "at-risk" infants) ▪ Survey of dental health care providers and parents to identify dental health needs in the county ▪ Sickle Cell education for childcare providers and preschool program staff ▪ Health Check Coordinator ▪ Nursing staff to visit childcare centers and verify immunization status of children ▪ Vision Screenings at childcare centers and family childcare homes ▪ Eye injury education for parents ▪ Immunization Service expansion ▪ Food and Nutrition education programs ▪ In-home breastfeeding support ▪ Pediatric Primary Care ▪ Parental Education in child development

Regular source of health care was classified using two different methods of coding. First there were four levels of regular source of health care: 1) Private Doctor, 2) Health Department or Community Health Center, 3) Emergency Department or No Regular Care, and 4) Other. Then these four categories were collapsed into two: 1) "Regular Source of Care" = Private Doctor and Health Department/Community Health Center combined, and 2) "No Regular Source of Care" = Emergency Room/No Regular Source of Care and Other combined. Although non-specific, "Other" included any of a variety of sources of episodic care ranging from private urgent-care clinics to military hospitals to unidentified sources.

Eligibility for free or reduced price lunch was based on federal poverty income guidelines (i.e., to be eligible for free or reduced price lunch, family income must be at or below 185% of the poverty level). In this analysis free or reduced price lunch (FRPL) status was determined based on school records and was used as a proxy for poverty.

Race was reported on the KHA form by children's parents or guardians. Race categories provided were White, Black, American Indian, and Other. Race was used as a measure of the effects of social classification,[16] not as proxy for socioeconomic status, as socioeconomic status is measured separately using FRPL.

Timely administration of individual immunizations was calculated using children's birth dates and the Recommended Childhood Immunization Schedule for 1998 as reference points.[17] The presence or absence and proper timing of those immunizations reported on the KHA were examined: diphtheria/tetanus/pertussis (DTP), polio, Hemophilis influenza type b (Hib), Hepatitis B (Hep B), Varicella (chicken pox), and measles/mumps/rubella (MMR).

Last vaccination on time analyzed in a single variable whether the last immunization in all of the required series of immunizations was administered on time based on the Recommended Childhood Immunization Schedule for 1998, children's birth dates, and the North Carolina School Immunization Requirements for 1998.[18] On time was defined as no later than two months after the child's individual immunization schedule required, based on birth date. Required vaccinations for children entering kindergarten in 1998 were DTP, Polio, Hib and MMR.[18]

Screening tests included blood pressure, hemoglobin or hematocrit, vision, hearing, and developmental.

> *Blood pressure* above 116/74 was defined as high (abnormal).[19] Values for systolic (the upper number) readings less than 40 or greater than 134 were considered "unbelievable" and not included in analysis. Values for diastolic (the bottom number) readings less than 20 or greater than 100 were considered "unbelievable" and not included in analysis.
>
> *Hemoglobin* values below 10.5 g/dl were considered abnormally low, indicating anemia.[20] Reported hemoglobin values that fell below 8 g/dl or above 19 g/dl were considered "unbelievable" and were not included in the final analysis.
>
> *Hematocrit* values below 33% were considered abnormally low, indicating anemia.[20] Hematocrit values that fell below 14% or above 48% were considered "unbelievable" and were not included in the analysis.

For the *developmental, vision, and hearing screening* variables, we presumed that the outcome of the screening was positive (i.e., abnormal) if the provider indicated "needs follow-up" for any of these three screening tests.

The *any illness or developmental problem* variable was endorsed if any of 23 boxes (22 named conditions plus "Other") under the "Illnesses and Developmental Problems" item on the KHA was checked by the health provider.

Illnesses/developmental problems. We examined individually the five illnesses and developmental problems reported most frequently on the KHA form: asthma, ear infection, speech problems, dental problems, and abnormal blood pressure.

Analysis

In the matched pairs data set, children with a Smart Start (SS) Health Intervention were matched with children without a SS Health Intervention within each county according to free or reduced price lunch (FRPL) status. The maximum number of children included from each county is 50. For example, if a county provided data on ten children who had received a SS Health Intervention and forty children who had not received a health intervention, only ten children at most from the non-SS group could be matched on FRPL status with a SS subject. In this county ten matched pairs, or twenty children, would be included in the matched pair data set. Children who received a SS Health Intervention were then combined and compared with all of the children who did not receive a SS Health Intervention. The matched pair data set was constructed to reduce the disproportion in the total number of subjects among the participating counties. A third round county that could not provide any control subjects and a fifth round county that had no subjects in the health intervention group were excluded from the matched pairs analysis.

In order to include all potential subjects in the analysis, and to corroborate findings from the matched pair analysis using a larger data set, all of the children from all of the counties are included in regressions using the full data set. This larger sample gives the analysis more statistical power. In the full data set children are categorized by receipt of SS Health Intervention ("yes" or "no"). Free or reduced priced lunch status and county serve as control variables.

Finally, the early vs. late county comparison is used to test whether length of exposure to Smart Start Health Interventions is associated with differences in health outcomes among children who had received a SS Health Intervention. Children who had received a SS Health Intervention in early round counties were compared to children who had received a SS Health Intervention in late round counties. One late round county had to be dropped along with its corresponding early round county because it was too soon to identify any intervention children.

Because African Americans are at a disadvantage compared to Whites in terms of health care access, immunizations, and morbidity and mortality,[10,11,12] a separate analysis was conducted to examine within-group differences. This sample was still included in prior analyses. For this separate analysis, all African American children (n=318) were selected from the full data set. African American SS children were matched with African American non-SS children within each county by free or reduced price lunch eligibility. Regular place of health care was compared for SS versus non-SS children.

All data were analyzed using Statistical Analysis System (SAS v. 6.12).[21] Most variables to be analyzed were dichotomous outcomes (for example, the presence or absence of a particular health condition). Chi-square and Fisher's exact test analyses were used to compare the SS vs. non-SS matched pairs. Logistic regressions were run to determine odds ratios. Logistic regression was also used with the full data set and with early vs. late data to estimate SS intervention effects. FRPL and county were controlled for in the full data set, and FRPL alone was controlled for in the early vs. late county regressions. Adjusted odds ratios (OR) are reported in these cases. Missing data were excluded in all statistical analyses.

RESULTS

Demographics

The sample included 2180 children, but information on health intervention status was not provided for 54 children. Their records were dropped from the data set, leaving 2126 children. (Table 2) Statistical analyses were performed to compare demographic variables (gender, race, ethnicity, free and reduced price lunch [FRPL] status) of the 54 children who were dropped from the sample and the 2126 children who remained in the sample. Children dropped from the analyses because of missing health intervention data were more likely to be eligible for FRPL than children who remained in the sample (85% vs. 63%, p=.001) and were more likely to be white than children who remained in the sample (57% vs. 36%, p=.003). Stratified analyses and adjusted regression models take these differences into account.

Table 2. Description of All Participating Children.

Characteristic	Total N =2126	Smart Start N =711 (33%)	Non-Smart Start N =1415 (67%)
Sex			
Girls	977 (46%)	305 (43%)	672 (48%)
Boys	1010 (47.5%)	341 (48%)	669 (47%)
Missing	139 (6.5%)	65 (9%)	74 (5%)
Free/Reduced Price Lunch Status			
Yes	1331 (63%)	495 (70%)	836 (59%)
No	749 (35%)	206 (29%)	543 (38%)
Missing	46 (2%)	10 (1%)	36 (3%)
Race			
African American	798 (38%)*	284 (40%)*	514 (36%)
White	745 (35%)	196 (28%)	549 (39%)
Other	83 (4%)	21 (3%)	62 (4%)
Missing	500 (24%)	210 (30%)	290 (21%)
Ethnicity			
Hispanic	127 (6%)	40 (6%)	87 (6%)
Non-Hispanic	557 (26%)	199 (28%)	358 (25%)
Missing	1442 (68%)	472 (66%)	970 (69%)

**may not add to 100% due to rounding.*

There were also significantly more children eligible for FRPL in the Smart Start group (70%) than in the non-Smart Start group (59%) (p=.001) in the full data set. (Table 2) This is controlled for in the regressions. Similarly, there were significantly more white children in the non- Smart Start group (39%) compared to children in the Smart Start group (28%) (p=.001) in the full data set, and significantly more African American children in the Smart Start group (40%) than in the non-Smart Start group (33%) (p=.001) in the matched pairs. (Table 3) Separate analysis of African American children partially addresses this bias. Chi-square and t-tests run on demographic variables for the early vs. late county children revealed no significant differences between the groups. Demographic characteristics for the African American sample of children are presented in Table 4.

Table 3. Description of Participating Children in Matched Pairs Analyses.

Characteristic	Total N =910	Smart Start N =455 (50%)	Non-Smart Start N =455 (50%)
Sex			
Girls	413 (45%)*	205 (45%)	208 (46%)
Boys	430 (47%)	214 (47%)	216 (47%)
Missing	67 (7%)	36 (8%)	31 (7%)
Free/Reduced Price Lunch Status			
Yes	612 (67%)	306 (67%)	306 (67%)
No	298 (33%)	149 (33%)	149 (33%)
Race			
African American	332 (36%)	182 (40%)	150 (33%)
White	308 (34%)	127 (28%)	181 (40%)
Other	25 (3%)	11 (2%)	14 (3%)
Missing	245 (27%)	135 (30%)	110 (24%)
Ethnicity			
Hispanic	63 (7%)	29 (6%)	34 (7%)
Non-Hispanic	239 (26%)	123 (27%)	116 (26%)
Missing	608 (67%)	303 (67%)	305 (67%)

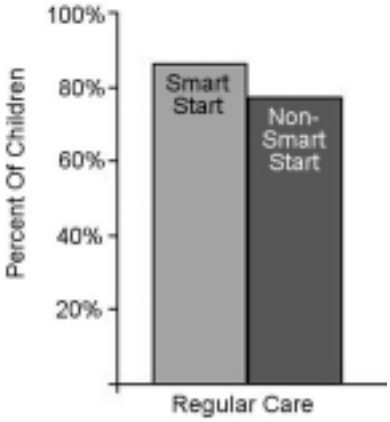
**may not add to 100% due to rounding.*

Table 4. Description of Participating Children in the African American Sub-Sample.

Characteristic	Total (N =318)	Smart Start (N =159)	Non-Smart Start (N =159)
Sex			
Girls	166 (52%)	79 (50%)	87 (55%)*
Boys	148 (46%)	77 (48%)	71 (45%)
Missing	4 (2%)	3 (2%)	1 (1%)
FREE/REDUCED PRICE LUNCH STATUS			
Yes	272 (86%)	136 (86%)	136 (86%)
No	46 (14%)	23 (14%)	23 (14%)

**may not add to 100% due to rounding.*

Source of Regular Health Care



When the four level place of care analysis was performed on the matched pairs sample, Smart Start children (38%) were more likely to use the health department or a community health center than non-Smart Start children (16%). On the other hand, 62% of non-Smart Start children reported a private doctor as their regular place of care vs. 48% of Smart Start children. Three percent (12 children) of non-Smart Start children vs. 1% (2 children) of Smart Start children noted "no source of care" or "emergency room" as their regular source of care. (Table 5) This result was also significant in the full data set (p=.001). When analyzed for two levels of regular source of care, the matched pair analysis showed that Smart Start children (86%) reported significantly higher use of a regular place of care than non-Smart Start children (77%) (p=.003). (Table 5) Smart Start children in late round counties were significantly less likely to have a regular place of care than children in an early round county (OR=.307, p=.0211).

Table 5. Source of Children's Regular Health Care.

	Whole Sample		Matched Pair Sample		African American Sample	
	Non-Smart Start (N=1133)	**Smart Start** (N=528)	**Non-Smart Start** (N=347)	**Smart Start** (N=332)	**Non-Smart Start** (N=119)	**Smart Start** (N=130)
4 Level						
ER/No Regular Place	5%	1%*	3%	1%	4%	2%
Health Dept./ CHC	12%	42%	16%	38%	16%	45%
Private Doctor	54%	47%	62%	48%	56%	43%
Other	29%	9%	19%	13%	24%	10%
2 Level						
No Regular Source	34%	10%	23%	14%	28%	12%
Regular Source	66%	90%	77%	86%	72%	88%

**may not add to 100% due to rounding.*

Regression models using the matched pair data showed that, controlling for free lunch status, children in the non-Smart Start group were one and one half times less likely to have a regular place of care compared to children in the Smart Start (SS) group (OR=1.5, p=.05). This finding was corroborated in the full data set (OR=1.9, p=.0002) and in the early vs. late data set. In the early vs. late county analysis, SS children in a late round county were significantly less likely to have a regular place of care than children in an early round county (OR=.311), (p=.02).

Regular source of health care was compared among the 318 African American children, 159 who were Smart Start participants and 159 who were non-Smart Start children. (Table 5) African American Smart Start children were less likely to use the emergency room or to have no regular place of care when compared to non-Smart Start African American children (2% vs. 4%). Smart Start children were more likely than non-Smart Start children to use a health department or a community health center as a regular source of care (45% vs. 16%). Non-Smart Start children were more likely to use "other" as a regular source of care than Smart Start children (24% vs. 10%). Non-Smart Start children were more likely to go to a private doctor than Smart Start children (56% vs. 43%). These results were statistically significant (p<.001).

Immunizations

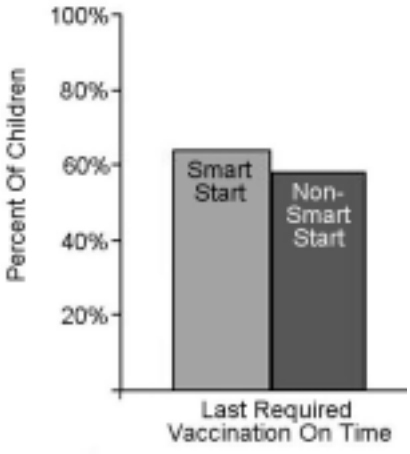
Results for Chi square analyses of immunization status are presented in Table 6. When controlling for FRPL, the regression model for the matched pairs revealed that non-Smart Start children were four and one-half times less likely to have a DTP immunization than Smart Start children (OR=4.5, p=.008).

Table 6. Immunization Table – Matched Pairs Data Set.

	Non-Smart Start	Smart Start	*p* Value
DTP			
Absence of Vaccination	25 (5%)	12 (3%)	.029
Presence of Vaccination	430 (95%)	443 (97%)	
Polio			
Absence of Vaccination	17 (4%)	8 (2%)	.067
Presence of Vaccination	437 (96%)	447 (98%)	
Hib			
Absence of Vaccination	169 (37%)	152 (33%)	.248
Presence of Vaccination	286 (63%)	302 (67%)	
Hep B			
Absence of Vaccination	88 (19%)	80 (18%)	.494
Presence of Vaccination	367 (81%)	375 (82%)	
MMR			
Absence of Vaccination	0 (0%)	0 (0%)	1.0
Presence of Vaccination	448 (100%)	449 (100%)	
Varicella			
Absence of Vaccination	61 (13%)	51 (11%)	.313
Presence of Vaccination	394 (87%)	404 (89%)	

Controlling for county and FRPL, regression models for individual immunizations in the full data set corroborated the findings from the matched pairs. Smart Start children were twice as likely to have their DTP vaccination than non-Smart Start children (OR=1.9, p=.03). Smart Start children also were twice as likely to have their polio vaccinations than non-Smart Start children, but that association was not statistically significant (OR=2.05, p=.07).

We examined whether or not the last vaccination for all required immunizations was given on time. Among the matched pairs, Smart Start children (64%) were more likely to have had all of their last required vaccinations on time than non-Smart Start children (58%), and this was nearly significant (p=.06). (Table 7) Regression models controlling for lunch status also showed Smart Start children to be more likely to have received the last vaccination of each series on time when compared to matched pairs (OR = 1.3, p=.06), but again, this was not significant.



Regarding the "last vaccination on time" variable and the presence of individual immunizations, there were no significant differences found between Smart Start children in the early vs. late county analysis.

Table 7. Last Vaccination On Time - Matched Pairs Data Set.

	Non-Smart Start	Smart Start	*p* Value
Last Required Vac. Not on Time	191 (42%)	163 (36%)	.057
Last Required Vac. On Time	264 (58%)	292 (64%)	

Screening Tests

Although Chi square analysis suggested differences between Smart Start and non-Smart Start children with respect to need for follow-up on two screening tests, these differences were not significant when controlled regressions were applied to either the full data set or the matched pairs.

Illness or Developmental Problems

As above, Chi square analysis suggested differences between Smart Start and non-Smart Start children in the prevalence of speech and dental problems, these were not significant in controlled regressions.

DISCUSSION

The finding that Smart Start Health Interventions are associated with parents' reports that their children have a regular source of health care is consistent across the three analysis strategies (matched pairs, full data set and early versus late counties). When controlling for FRPL and when analyzed separately for African American children, the statistical associations are stronger than for all children combined. This suggests that Smart Start Health Interventions have a greater impact among populations with greater need. Along with Smart Start Health Interventions, greater need may explain part of the difference between the early and late counties, given that many late SS counties tended to be more rural and poor than early round counties.

In the case of immunizations, only DTP among the individual immunizations was consistently more up-to-date among Smart Start children in the three analyses and when controlling for FRPL. Perhaps more interesting is the observation that, although not quite significant, Smart Start children tended to have had their last vaccinations on time, even when FRPL was controlled for. This is a very high threshold to achieve. That there was no difference in last vaccination on time between early and late counties may suggest that the effect of Smart Start on immunization status may be attained in a shorter period of time than the effect of SS on access to a regular source of care. Late counties can be just as successful at improving immunization status because there is only one window of opportunity for completing a child's immunization on time, and that window is the same regardless of whether a county has been participating in Smart Start for one year or four years.

Limitations

This evaluation is closer in spirit to a meta-analysis than to evaluation research in that it includes as many different health interventions as there are Partnerships in the sample, and it relies on data collected by another agency for a different purpose. The post-hoc design, while the most feasible, is not as strong as a prospective study with matched controls might have been. The design of this study does not lend itself to causal inference. Finally, perhaps the major limitation of this study is the quality of the KHA data in the first place. Many of the data elements were missing or incomplete. Nevertheless, the results are informative. There are many statistically significant associations between Smart Start Health Interventions and two major outcomes, regular place of care and better immunization status, but it is not possible to determine which intervention or interventions among the many implemented by the 11 counties may have contributed to the association.

CONCLUSIONS

This study has found significant health care access and immunization differences between children exposed to a Smart Start Health Intervention and matched control children who were not so exposed. Specifically, the Smart Start group was more likely to report use of a regular source of health care, and they had better immunization status. With respect to the DTP series of immunizations specifically, the odds of a child who had been exposed to a SS Health Intervention being up-to-date were large and statistically significant. Given the source of the data and the cross-sectional nature of the analysis, it is not possible to conclude that Smart Start is the cause of the improvements. Nevertheless, some observations lend support to this hypothesis, especially the fact that poorer children and African American children, both of whom would have been expected to have lower immunization levels and less access to regular health care, in fact benefited from Smart Start more. This is unlikely to have happened by chance.

The fact that screening tests and illness status did not differ between SS and non-SS children might be disappointing at first, but in reality finding such differences would be difficult to interpret. Either outcome, that children exposed to a SS Health Intervention have better or worse screening results, could be interpreted as evidence of a Smart Start benefit or a Smart Start failure. The fact that these health status indicators did not differentiate between SS and non-SS subjects makes it more likely that the immunization and access to care differences were the result of Smart Start and not a consequence of differences in health care needs.

In conclusion, these results support the hypothesis that exposure to Smart Start Health Interventions improves access to immunizations and utilization of a regular source of health care. These behaviors are likely associated with improved health status and lower costs for routine health services. It is encouraging that such outcomes are observable among children who were less well off, as measured by their eligibility for free or reduced price lunch, and who participated in a comprehensive intervention within which health services were one of many parts. This approach may fill in gaps in access to care that a health-specific intervention may not.

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APPENDIX A: KINDERGARTEN HEALTH ASSESSMENT REPORT

PPS-2K Rev. 9/96

KINDERGARTEN HEALTH ASSESSMENT REPORT

(Approved by North Carolina Department of Public Instruction and Department of Environment, Health, and Natural Resources)

I. PERSONAL DATA *(TO BE COMPLETED BY PARENT OR GUARDIAN)*

(Please Print Clearly)

Child's Name _____ _____ _____
Last *First* *Middle*

Birthdate: __ __ /__ __ /__ __ (mo. day year) Sex: ❑ 1 Male ❑ 2 Female Race: ❑ 1 White ❑ 2 Black ❑ 3 Am. Indian ❑ 4 Other Hispanic: ❑ 1 Yes ❑ 2 No

County of Residence: _____ Zip Code: __ __ __ __ __

School your child will be attending _____

Place where your child gets regular health care: *(Check one)*
❑ 1 Health Department ❑ 2 Emergency Room/Hospital ❑ 3 Community Health Center ❑ 4 Private Doctor/HMO ❑ 5 Other _____ ❑ 6 No Regular Place

List health problems that might affect your child's performance in school: _____

II. HEALTH ASSESSMENT *(TO BE COMPLETED BY HEALTH CARE PROVIDER)*

The health assessment must be conducted by a physician licensed to practice medicine, a physician's assistant as defined in General Statute 90-18, a certified nurse practitioner, or a public health nurse meeting the State standards for Health Check Services.

Date of Assessment: __ __ /__ __ /__ __ (mo. day year) **Are all immunizations complete at this time?** ❑ 1 Yes ❑ 2 No *(Complete immunization history on reverse side)*

Weight: _____ lbs. Weight relative to height is: ❑ 1 Normal ❑ 2 Underweight ❑ 3 Overweight

Height: _____ ft. _____ in. **Blood Pressure:** _____ / _____

Vision:

	R	L	Both
Far	20/	20/	20/

With Glasses: _____ ❑ 1 Yes ❑ 2 No Needs Follow-Up: _____ ❑ 1 Yes ❑ 2 No

Hearing:

	500	1000	2000	4000
R				
L				

Pure Tone: _____ dB level (usually 20 dB) With Hearing Aid: ❑ 1 Yes ❑ 2 No Needs Follow-Up: ❑ 1 Yes ❑ 2 No

Development: ❑ 1 Within Normal Range ❑ 2 Needs Follow-Up
Test(s) used (optional) _____

Hematocrit: _____ %
OR
Hemoglobin: _____ gm/dl ❑ 1 Within Normal Range ❑ 2 Needs Follow-Up

Illnesses or Developmental Problems *(Please check any of the following that the child has):*

❑ 1 Asthma
❑ 2 Bleeding Problems
❑ 3 Bone/Muscle Problems
❑ 4 Bowel Problems
❑ 5 Cancer/Leukemia
❑ 6 Attention/Learning
❑ 7 Convulsions/Seizures
❑ 8 Cystic Fibrosis
❑ 9 Cerebral Palsy
❑ 10 Dental Problems
❑ 11 Diabetes
❑ 12 Emotional/Behavioral
❑ 13 Ear Infections
❑ 14 Heart Problems
❑ 15 Hearing Problems
❑ 16 Meningitis
❑ 17 Sickle Cell Anemia
❑ 18 Vision Problems
❑ 19 Skin Problems
❑ 20 Speech Problems
❑ 21 Stomach Aches
❑ 22 Urinary/Bladder
❑ 23 Other _____
❑ 24 NONE

For those illnesses or developmental problems checked above, please provide additional information on the reverse side.

III. IMMUNIZATION RECORD *(TO BE COMPLETED ONLY BY HEALTH CARE PROVIDER)*

Enter date of EACH dose – Mo/Day/Year

VACCINE	#1	#2	#3	#4	#5
DTP, DTaP, DT					
Polio					
Hib					
Hepatitis B					
MMR					
Measles					
Mumps					
Rubella					
Varicella					

Exemptions from N.C. State Immunization Law require that a statement must be on file at school in student's permanent record. Exemptions must meet requirements of the law. Consult your local health department.

❑ Medical ❑ Religious Exemption

STATE LAW REQUIRES THE FOLLOWING MINIMUM DOSES:

5 DTP, DTaP, DT doses (if 4th dose is after 4th birthday, 5th dose is not required.)
4 POLIO VACCINE doses (if 3rd dose is after 4th birthday, 4th dose is not required.)
1 Hib dose - At least 1 Hib on/after 1st birthday and before 5 years of age. (Not required after age 5)
2 MMR doses (1st dose on/after 1st birthday)

IV. FURTHER HEALTH INFORMATION *(TO BE COMPLETED BY HEALTH CARE PROVIDER)*

Please provide additional information about illnesses or developmental problems checked on the reverse side. Also, provide information about any other important health conditions.

In your opinion, will any of the above illnesses or conditions affect the child's performance in school? If so, specify:

What specialized care is the child receiving related to these problems?

List any allergies that the child has (e.g., food, insect stings, medicine, etc.):
What type of allergic reaction occurs?

Does this child take medication on a regular basis? ❑ Yes ❑ No If yes, list medication, dose, and possible side effects.

Does this medication need to be given at school? ❑ Yes ❑ No If yes, list frequency and duration:

Does this child need a special diet? ❑ Yes ❑ No If yes, specify modifications:

Please list any additional medical care that is indicated for this child at this time:

Signature of Health Care Provider: Date:

Address: Phone No.:

APPENDIX B: KINDERGARTEN HEALTH ASSESSMENT DATA SHEET

KINDERGARTEN HEALTH ASSESSMENT DATA SHEET

_ _ /_S_ / _ _ _ /_ _ _ _
county setting school code indiv ID

Social Security #: _ _ _/_ _/_ _ _ _
Evaluator's Initials: _ _ _
Date: _ _/_ _/_ _

I. PERSONAL DATA

Birthdate: _ _/_ _/_ _ ☐ Missing

Sex: ☐ 1 Male ☐ Missing
☐ 2 Female

Race: ☐ 1 White ☐ 3 Am. Indian ☐ Missing
☐ 2 Black ☐ 4 Other

Hispanic: ☐ 1 Yes ☐ Missing
☐ 2 No

Place where your child gets regular health care: ☐ Missing
☐ 1 Health Department
☐ 2 Emergency Room/Hospital
☐ 3 Community Health Center
☐ 4 Private Doctor/HMO
☐ 5 Other _____
☐ 6 No Regular Place

II. HEALTH ASSESSMENT

Weight:_____lbs. ☐ Missing
Weight relative to height is: ☐ 1 Normal ☐ 2 Underweight ☐ 3 Overweight ☐ Missing
Height:_____ft._____in. ☐ Missing **Blood Pressure**:_____/_____ ☐ Missing

Vision: ☐ Missing With Glasses: ☐ 1 Yes ☐ 2 No ☐ Missing
Needs Follow- Up: ☐ 1 Yes ☐ 2 No ☐ Missing

	R	**L**	**Both**
Far	20/	20/	20/

Hearing: ☐ Missing
Pure Tone: _____dB level ☐ Missing
With Hearing Aid: ☐ 1 Yes ☐ 2 No ☐ Missing
Needs Follow- Up: ☐ 1 Yes ☐ 2 No ☐ Missing

	500	**1000**	**2000**	**4000**
R				
L				

Development: ☐ 1 Within Normal Range
☐ 2 Needs Follow-up
☐ Missing

Hematocrit: _____%
OR ☐ Missing
Hemoglobin: _____gm/dl

Illness or Developmental Problems: ☐ Missing

☐ 1 Asthma	☐ 7 Convulsions/Seizures	☐ 13 Ear Infections	☐ 19 Skin Problems
☐ 2 Bleeding Problems	☐ 8 Cystic Fibrosis	☐ 14 Heart Problem	☐ 20 Speech Problems
☐ 3 Bone/Muscle problems	☐ 9 Cerebral Palsy	☐ 15 Hearing Problems	☐ 21 Stomach Aches
☐ 4 Bowel Problems	☐ 10 Dental problems	☐ 16 Meningitis	☐ 22 Urinary/Bladder
☐ 5 Cancer/Leukemia	☐ 11 Diabetes	☐ 17 Sickle Cell Anemia	☐ 23 Other_____
☐ 6 Attention/Learning	☐ 12 Emotional/behavioral	☐ 18 Vision Problems	☐ 24 None

III. IMMUNIZATION RECORD ☐ Missing

Vaccine	**#1**	**#2**	**#3**	**#4**	**#5**
DTP,DtaP,DT					
Polio					
Hib					
Hepatitis B					
MMR					
Measles					
Mumps					
Rubella					
Varicella					

Exemption from immunizations: ☐ Medical ☐ Religious ☐ Missing

Does this child take medication on a regular basis? ☐ Yes ☐ No ☐ Missing

Does this medication need to be given at school? ☐ Yes ☐ No ☐ Missing

Does this child need a special diet? ☐ Yes ☐ No ☐ Missing

OTHER REPORTS AND PUBLICATIONS FROM THE UNC SMART START EVALUATION TEAM

Frank Porter Graham Child Development Center
University of North Carolina – Chapel Hill

∞ Child Care Quality

Validating North Carolina's 5-Star Child Care Licensing System (February 2001). *Independently gathered data from 84 child care centers validates North Carolina's new 5-star child care licensing system. Centers with higher star ratings are indeed providing a higher quality of care for young children.*

Family Child Care in North Carolina (August 2000). *This report describes a study that documented the quality of care in family child care homes and the relationship between quality and participation in Smart Start.*

Smart Start and Quality Inclusive Child Care in North Carolina (May 2000). *The study described in this report examined the role of Smart Start in supporting high quality inclusive child care.*

Quality of Early Childhood Programs in Inclusive and Noninclusive Settings (1999). *Buysse, V., Wesley, P. W., Bryant, D., & Gardner, D. Exceptional Children, 65, 301-314. Article published in a peer review journal. Based on* Effects of Smart Start on Young Children with Disabilities and their Families (December 1996).

Effects of a Community Initiative on the Quality of Child Care (1999). *Bryant, D., & Maxwell, K. Early Childhood Research Quarterly, 14, 449-464. Article published in a peer-reviewed journal. Based on* The Effects of Smart Start on the Quality of Child Care (April 1997).

Effect of a Smart Start Playground Improvement Grant on Child Care Playground Hazards (August 1998). *This report presents results from a comparison of the playground safety of child care playgrounds in a county that used Smart Start funds for playground improvement compared to a non-Smart Start county.*

Child Care in the Pioneer Partnerships 1994 and 1996 (December 1997). *This report presents more detailed information about child care centers that were included in* The Effects of Smart Start on the Quality of Child Care (April 1997).

The Effects of Smart Start on the Quality of Child Care (April 1997). *This report presents the results of a 2-year study of the quality of child care in the 12 pioneer partnerships.*

Effects of Smart Start on Young Children with Disabilities and their Families (December 1996). *This report summarizes a study of the impact of Smart Start on children with disabilities.*

Center-based Child Care in the Pioneer Smart Start Partnerships of North Carolina (May 1996). *This brief report summarizes the key findings from the 1994-95 data on child care quality.*

∞ Kindergartners' Skills

A Six-County Study of the Effects of Smart Start Child Care on Kindergarten Entry Skills (September 1999). *This report presents results from kindergartners in six counties who attended Smart Start-funded child care centers compared to a random group of kindergartners who attended a broad range of child care.*

The Effects of Smart Start Child Care on Kindergarten Entry Skills (June 1998). *This report presents results from a pilot study of kindergartners in one county who attended Smart Start-funded child care centers compared to a random group of kindergartners who attended a broad range of child care or no child care.*

Kindergartners' Skills in Smart Start Counties in 1995: A Baseline From Which to Measure Change (July 1997). *This report presents baseline findings of kindergartners' skills in the 43 Smart Start counties.*

∞ Health

The Effect of Smart Start Child Care on Children's Access to Health Care at Kindergarten Entry (September, 2000). *This brief report presents findings of the impact of Smart Start on children's health.*

∞ Collaboration

Collaboration: A Smart Start Success (in press). *This report summarizes findings of a multi-year study of the impact Smart Start has had on local interagency collaboration among organizations that serve young children.*

Smart Start Collaboration Network Analysis (June 2000). *This report provides new information on the collaboration occurring among local agencies that are attempting to meet the needs of children under the age of six.*

Smart Start and Local Inter-Organizational Collaboration (August 1998). *This report presents data about the effectiveness of the Smart Start initiative on improving collaborative relationships. Qualitative and quantitative data were obtained from 269 respondents in 10 local Partnerships.*

Bringing the Community into the Process: Issues and Promising Practices for Involving Parents and Business in Local Smart Start Partnerships (April 1997). *This report describes findings from interviews and case studies about the involvement of parents and business leaders in the Smart Start decision-making process.*

∞ Understanding the Smart Start Process

Building Community-Owned Public-Private Partnerships (June 2000). *This study examined more closely what the public-private partnership aspect of Smart Start has meant to stakeholders, their perceptions of what got in the way of and what facilitated successful public-private partnerships, and their strategies for obtaining and sustaining meaningful private sector involvement.*

Reinventing Government? Perspectives on the Smart Start Implementation Process (November 1995). *This report documents pioneer partnership members' perspectives on 2 major process goals of Smart Start: non-bureaucratic decision making and broad-based participation.*

Keeping the Vision in Front of You: Results from Smart Start Key Participant Interviews (May 1995). *This report documents the process as pioneer partnerships completed their planning year and moved into implementation.*

Emerging Themes and Lessons Learned: The First Year of Smart Start (August 1994). *This report describes the first-year planning process of the pioneer partnerships and makes some recommendations for improving the process.*

∞ Annual Reports

Smart Start Services and Successes: 1999-2000 Annual Evaluation Report (June 2000). *Progress in the provision and quality of services are tied to the longer-range goal of increased preparedness for school.*

North Carolina's Smart Start Initiative: 1998 Annual Evaluation Report (January 1999). *This report summarizes evaluation findings related to each of the four major Smart Start goals.*

North Carolina's Smart Start Initiative: 1996-97 Annual Evaluation Report (April 1997). *This report summarizes evaluation findings related to each of the four major Smart Start goals.*

North Carolina's Smart Start Initiative: 1994-95 Annual Evaluation Report (June 1995). *This report summarizes the evaluation findings to date from both quantitative and qualitative data sources.*

Smart Start Evaluation Plan (September 1994). *This report describes our comprehensive evaluation plan at the onset of the evaluation, designed to capture the breadth of programs implemented across the Smart Start partnerships and the extent of possible changes that might result from Smart Start efforts.*

∞ Other

Smart Start Client Information System Feasibility Study (September 1998). *This report presents findings from a study of the feasibility of creating a system to count uniquely all children and families served by Smart Start.*

Families & the North Carolina Smart Start Initiative (December 1997). *This report presents findings from family interviews of families who participated in Smart Start in the pioneer counties. The interviews included questions about child care, health services, family activities with children, and community services and involvement.*

To obtain copies of these reports, please visit our web site at www.fpg.unc.edu/smartstart or call Marie Butts at (919) 966-4295, or email her at Marie_Butts@unc.edu