

DENTAL CARE USE AND ACCESS FOR SPECIAL NEEDS CHILDREN

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I. Introduction

A. Nature of the Research Problem

Tooth decay, or dental caries, is the most common childhood chronic disease (Edelstein and Douglas, 1995). Tooth decay is regarded as the primary marker for children's oral health, while visits to the dentist are the best measure of the receipt of dental care. Some evidence shows that nearly 50% of children ages 5 to 17 have decayed, missing or filled tooth surfaces and teeth (Kaste et al. 1996). Children who are disadvantaged by poverty, minority status and social conditions tend to experience higher rates of dental caries, more extensive destruction of their dentition when affected, higher rates of untreated diseases and a higher frequency of dental pain compared to higher income children. Although low income minority children are disproportionately affected and are in greater need of dental care, they are more likely to go untreated. The failure to obtain dental care by low income children is somewhat paradoxical because children in poverty, as well as children regarded as near poor, tend to have the highest rates of dental insurance coverage, primarily through state Medicaid and SCHIP programs (Edelstein, 2002).

Other evidence shows that few children covered by Medicaid receive the preventive dental care recommended by the Early and Periodic Screening, Diagnosis and Treatment program (DHHS, 1996). Multiple reasons explain why children do not obtain needed care. For dentists who tend to operate as independent practitioners, the access problems can be attributed to low fees, burdensome paperwork, reimbursement delays, aversion to managed care and missed appointments. For low income families, preventive dental care tends to be a low priority relative to medical care. Many low income families are not aware of the importance of good oral hygiene. Consequently, many Medicaid families miss appointments or forgo dental care altogether.

The American Academy of Pediatric Dentists (AAPD) recognizes that low income minority children with Medicaid coverage tend to have high levels of dental need, yet such children are more likely to go untreated relative to children from higher income households. The AAPD has disseminated such information to its members and has encouraged pediatric dentists across the US to treat Medicaid eligible low income children (www.aapd.org/publication, 2003). Furthermore, the AAPD acknowledges that low income children with special health care needs (SHCN) are at greater risk of developing oral health problems than low income "healthy" children. For a number of reasons, when children with SHCN develop oral health problems, they tend to involve more serious health consequences relative to low income "healthy" children.

There are several reasons why oral health problems are more prevalent and tend to be more complex among children with SHCN in comparison to "healthy children" (Ferguson, 2001). While not an exhaustive list, the reasons include: 1) physical handicap, developmental problem or serious medical illness that prevents a child from brushing his/her teeth; 2) lack of effective daily hygiene by caregivers; 3) specific behaviors of the child with SHCN that prevent the caregiver from providing thorough hygiene; 4) frequent consumption of carbohydrates, starches and nutritional supplements; 5) the use of sugars and starches to reward the child with SHCN in school programs and/or at home; 6) frequent use of oral medications that contain sugars; 7)

dependence on nursing bottles for feeding rather than age appropriate foods; 8) poor chewing and swallowing that allow the food to remain in the mouth; 9) repeated vomiting so that swallowed foods and/or stomach acids enter the mouth; 10) medications (anti-seizure or behavior control) that may cause dry mouth, ulcers or gum swelling; 11) any condition that makes mouth tissues sensitive (cold sores or ulcers); 12) crowded teeth which makes oral cleaning more difficult; 13) excessive drooling; 14) self-abusive behaviors; and 15) birth defects that makes feeding difficult.

While children with SHCN are at greater risk of developing oral health problems, they are also more prone to have higher levels of unmet need, yet lower levels of use of dental services than healthy children. Dentists have cited several barriers to providing care for children with SHCN. These include: office limitations to accommodate a special needs child, scheduling complications, inadequate reimbursement, children's behavioral problems, few dentists with appropriate training, burdensome paperwork, and managed care.

While unmet need for dental care among children covered by Medicaid has become even more pervasive in recent years, enrollment in Medicaid managed care (MC) has grown rapidly as most states have replaced their FFS approach with some form of MC. Most states, however, have limited mandatory enrollment in MC to Medicaid recipients eligible under either Temporary Assistance for Needy Families (TANF) or the Sixth Omnibus Budget Reconciliation Act (SOBRA). Relatively few states have enrolled children with SHCN into capitated MC because the financial incentives inherent in such plans to control costs may elicit under-treatment, restrict access to specific procedures, services and specialty providers, and have adverse effects on quality (Hughes and Luft, 1998; Fox and McManus, 1998). Policymakers recognize that the shift to Medicaid MC is likely to have the most profound impact on poor children with chronic or disabling physical health conditions and/or mental health problems simply because this group of children must rely on a wide array of specialty providers (Fox and McManus, 1998). On the other hand, MC plans offer advantages such as coordination of services, case management and an ongoing relationship with a primary care provider.

B. Purpose and Scope

Whether managed care is likely to foster or inhibit access to and use of dental care by children with SHCN is unclear. If dental providers are more averse to dealing with Medicaid managed care than the FFS option, then access to dental care may be more problematic for children with SHCN enrolled in MC compared to those who opt to remain in the FFS system. On the other hand, dental providers may find it easier to treat children with SHCN enrolled in MC because the case manager is available to assist the family in coordinating and arranging services for the child. If so, this suggests that children with SHCN enrolled in MC should be more prone to keep dental appointments. Irrespective of type of coverage (FFS versus MC), access to dental care is likely to be a more acute problem for children with SHCN simply because their parents are likely to give priority to obtaining medical services over dental care (Ferguson, 2001). Despite the low rates of use of dental care among low income children and the recent widespread growth of Medicaid MC, research examining the effects of MC arrangements on utilization of and access to dental care for children with SHCN is essentially nonexistent (Szilagyi, 1998).

This research project addresses this gap in knowledge. First, we analyze Medicaid eligibility, claims and encounter data spanning the years 1998-2001 for children with SHCN enrolled in the DC Medicaid program to evaluate the effects of plan choice (MC versus FFS) on use of dental care services. Second, we will evaluate the effect of plan choice on access to (unmet need for) dental services. To evaluate access to (unmet need for) dental care, we rely on recently conducted interviews with caregivers of children with SHCN enrolled in the DC Medicaid program. We conducted 1,088 baseline interviews with caregivers and re-interviewed 88% or 937 caregivers. The availability of baseline and follow-up data enable us to evaluate unmet need for dental care over time.

Our study addresses the following strategic research issue identified by the Maternal and Child Health Bureau for FY 2004-2009: Strategic Research Issue #1: Public health services systems and infrastructure at the community, State and/or national levels, as they apply to different maternal and child Health (MCH) populations based on demographic, epidemiological, and/or other factors. HSCSN assigns a case manager to each child and requires that each child have a PCP. Children enrolled in FFS are less likely to have a PCP and they do not have a case manager to help their caregiver coordinate services. Because we analyze whether access and use of dental services varies by plan type (partially capitated MC versus FFS), we are comparing children with SHCN who receive care under alternative public health services systems. Our findings highlight the relative importance of case management and a PCP for Medicaid children with SHCN.

II. Review of the Literature

Tooth decay is the most common health problem affecting US children (GAO, 2000b). Yet, dental caries can be prevented by a combination of measures such as water fluoridation, professionally applied sealants and topical fluorides, and the use of fluoride toothpastes. Dental care is the most prevalent unmet need among US children. Although many low income children are covered by Medicaid or SHCIP programs, they tend to experience high levels of unmet need for dental care. Recent evidence indicates that only 20% of children covered by Medicaid received the preventive oral care for which they are eligible (Mouradian et al, 2000). Below we review the literature that exists regarding children's access to and use of dental care under Medicaid. This review highlights that low income children enrolled in Medicaid tend to have very high level of dental treatment needs, yet they have the least access to dental care. Consequently, they have fewer dental visits, poorer oral health outcomes and lower use of protective sealants compared to higher income children (Mouradian et al., 2000). Little research, however, has examined whether access to and use of dental services varies by plan choice (MC versus FFS).

Insurance: Poor oral health and lack of dental care appear to be most prevalent among low-income preschool children, who are twice as likely to have cavities than higher income preschoolers (Edelstein, 2002). Relative to children from higher income families, Medicaid-eligible children who develop cavities have twice the numbers of decayed teeth and more than double the number of visits for pain relief, yet they have fewer total dental visits (Edelstein, 2002). Manski, et al. (2001) evaluated the impact of dental insurance coverage on children's use of dental services and expenditures using data from the 1996 Medical Expenditure Panel Survey. About 56% of children with private dental insurance had at least one dental visit, compared to

28% of children enrolled in Medicaid and 19% of children who lacked dental insurance. More recently Macek et al (2005) found similar patterns for Maryland schoolchildren. Children with private coverage experienced the highest rates of regular dental care (89.7%) followed by children with coverage under Medicaid or the Maryland Children's Health Program (73.7%) and the uninsured (69.4%).

Patterns of Care: Robison et al. (1998) evaluated dental treatments received; related needs to treatment received and described enrollment and use over an 8-year period for children enrolled in the North Carolina Medicaid program. Half of Medicaid enrolled children never used dental services. Among users, 45% and 25% of children needed restorations in primary and permanent teeth, respectively. Among users, 29% had all needs met, 28% had needs partially met and 43% had no needs met.

Cashion et al. (1999) also examined children's use of dental care in the North Carolina Medicaid program. They characterized children's patterns of care for three and eight year old children by provider (general dentists versus pediatric dentists). Their results show that the use of Medicaid dental services by both groups was severely limited in both yearly cohorts; pediatric dentists, however, tended to provide more complete coverage and less sporadic care.

Two studies evaluated the use of dental sealants among children enrolled in Medicaid. Weintraub et al. (2001) compared the likelihood of restorative treatments and associated cumulative Medicaid expenditures for teeth with or without dental sealants for Medicaid-enrolled children in North Carolina. They found that 23% of children received at least one sealant and 33% had at least one caries-related services involving the occlusal surface (CSROs). Sealants were effective in preventing CSROs, although the degree of effectiveness was highest for children with greater levels of CSROs before sealant placement. Sealant placement resulted in Medicaid expenditure savings for certain high-risk children. Dasanayake et al. (2001) compared sealant users and non-users in the Alabama Medicaid program to identify potential barriers to achieving the 2010 sealant objective. They concluded that racial and gender disparities in obtaining dental care, the lack of a Medicaid-participating dentists within the county of residence and lower payment/claim ratios have negative effects of the use of sealants.

Race and Geographic Location: Byck, Walton and Cooksey (2002) examined urban/rural differences in dental utilization rates of Illinois children enrolled in either Medicaid or SHCIP. Their regression analyses revealed no significant relationship between the utilization of dental care by Medicaid-enrolled children after controlling for several dental supply and population factors. The proportion of children enrolled in Medicaid and the participating dentist to population ratio, however, were significant determinants of use.

Dasanayake et al. (2002) evaluated disparities in dental service utilization among Medicaid-enrolled children in Alabama. They found significant racial disparities in use of dental services among Medicaid enrolled children. Availability of a participating dentist within the county of residence and lower reimbursement to charge ratios were among the factors that contributed to low use of dental services.

Initiatives to Increase Access: Other research has evaluated the effectiveness of specific initiatives designed to improve access to dental care. Milgrom et al. (1999) evaluated Washington state's Access to Baby and Child Dentistry (ABCD) Program on use of dental care. The ABCD program, first implemented in Spokane county, offered extended dental benefits to participating Medicaid-enrolled children and higher fees for certified providers. They found that a child in the ABCD program was 7.2 times as likely to have at least one dental visit as a Medicaid enrolled child not in the program. Grembowski and Milgrom (2000) further evaluated the ABCD program in Washington state by conducting telephone interviews with 465 parents of children age 13 to 36 months and re-interviewed 282 of these parents one year later. About 43% of children enrolled in the ABCD program visited a dentist in the follow-up year, compared to 12% of children not enrolled. An ABCD child was 5.3 times as likely to have at least one dental visit as a child not in the ABCD program. ABCD children were 4 to 13 times as likely to have received specific dental services. The ABCD program also reduced dental fear and resulted in greater parental satisfaction.

Nagahama et al. (2002) evaluated the impact of a dental society managed dental program, known as Mom and Me, in Yakima County in Washington state. Their findings reveal that the number of dentists who routinely treat Medicaid-enrolled children increased by more than 100%, from 15 to 38 general dentists. During the first two years of the program, more than 4700 children were enrolled and more than half visited a dentist during this time period.

Nietert et al. (2005) used Medicaid claims data to evaluate the impact of a series of reforms implemented by South Carolina in early 2000 to increase access to dental services for children. The centerpiece of the reform was a policy that increased reimbursement rates to the 75th percentile of dentist's charges. Nietert et al found that the total number of dental procedures in 2000 was significantly higher than would have been expected given the downward trends during the two years prior to the reform. They concluded that raising reimbursement rates had a substantial positive effect on access to dental services for children under Medicaid.

Eklund et al. (2003) evaluated a demonstration program in Michigan called Healthy Kids Dental (HKD). HKD was designed to replicate the success of the dental component of Michigan's SCHIP program, MICHild. Under MICHild and HKD, dental coverage was administered by private dental carriers which reimbursed dentists at the same rates paid by private plans. During the first year of implementation the number of children who received dental care increased by 32.3% in the original 22 counties. In contrast, utilization levels remained unchanged in counties not chosen to participate. Nonetheless, because the participants were primarily from rural counties with limited access to dental care, the findings may not be generalized to children who reside in inner cities and the suburbs.

Hughes et al (2005) examined dentist participation and use of dental care among children before and after Indiana Medicaid increased its reimbursement rates to 100% of the 75th percentile of usual and customary fees in 1998. Descriptive findings suggest the reimbursement increase caused more dentists to enroll in Medicaid and more to actually participate. In 1997, before the fee increase, 38.2% of licensed dentists were enrolled and 57.2% of enrolled dentists participated. In 2000, 48.1% of licensed dentists were enrolled and 63.6% of enrolled dentists participated. Damino et al, also found that 32% of Medicaid children received services in 2000

after the reforms were implemented, compared to 18% of Medicaid children before the fee increases.

Under NC Health Choice, the state SCHIP program, dentists are paid 100% of their usual, customary, and reasonable (UCR) rates. North Carolina Medicaid, on the other hand, paid an average of 62% of dentists' UCR rates in 1999. Slifkin et al. (2004) compared NC Health Choice enrollees that were uninsured the year before NC Health Choice implementation with enrollees that were insured by Medicaid in the previous year. In the year before implementation, 57% of children in the Medicaid group had at least 1 dental visit as opposed to only 33% of children in the uninsured group. Both groups saw increases in access to dental care after implementation, but the increase was much greater for the uninsured group. Although the study suggests that the more generous reimbursement rates led to increased access, it is also possible that dentists perceived the NC Health Choice population differently than the Medicaid population (working poor as opposed to welfare recipients), and that this perception may have contributed to the positive results.

Managed Care: Empirical evidence documenting children's use of and access to dental services under MC versus FFS is sparse. In conclusion, Medicaid-enrolled children have high levels of unmet need for dental care and low levels of use. The effects of Medicaid MC versus Medicaid FFS on access to and use of dental services among enrolled children is unknown. The percentage of children with an unmet need for dental care and the low levels of use of dental care may become exacerbated under Medicaid managed care because most dentists are averse to managed care arrangements. Dentists have cited several barriers to providing care for children with SHCN. Thus, managed care may have greater adverse effects on access to and use of dental care among children with SHCN. Nevertheless, no research has examined the effects of Medicaid MC on use of and access to dental care among children with SHCN. This is surprising given that oral health problems occur more frequently and tend to be more complex among children with SHCN compared to healthy children.

III. Study Design and Methods

III. A. Study Design

1. To evaluate the effect of plan choice (Medicaid partially capitated MC versus Medicaid FFS) on use of dental services by children with (SHCN) who qualify for the DC Medicaid program under the criteria for (SSI). The primary source of data for these analyses is Medicaid eligibility and claims/encounter type data available from the DC Medicaid program. Findings from the few studies that have attempted to evaluate Medicaid MC for children with SHCN are limited because they do not control for the potential non-random selection associated with the choice between FFS and Medicaid MC. Failure to recognize unobservable factors affecting plan choice is likely to bias comparisons of children who enroll in FFS and those who opt for MC. We estimate a recursive bivariate probit model to control for the potential non-random selection associated with program participation and to recognize the possibility that plan choice and use of dental services are jointly determined. The indicators of utilization include visits for: 1) oral exams; 2) preventive services (dental prophylaxis and dental sealants); 3) restorative treatments

(crowns, amalgams, and acrylics) and 4) specialized services (endodontics, periodontics, and oral surgery).

2. Using data gathered from telephone interviews with caregivers of children with SHCN, we will analyze the effect of plan choice (Medicaid MC versus Medicaid FFS) on access to dental services among children with SHCN. The first round of interviews with caregivers was completed in November 2002. The second round of interviews was completed in July 2003; the two interviews were approximately seven months. We are able to address two problems that hamper prior research on this subject. First, nearly all prior studies on children enrolled in Medicaid MC plans have attempted to analyze access to care with claims data. Because claims or encounter data provide no information on children who need care but are not able to obtain services, analysis of such data reveals patterns of service use but does not reflect unmet need. Second, since existing evidence regarding access to both medical and dental services is cross-sectional, it does not indicate whether access problems or unmet needs persist over time.

III. B. Population Studied

The District of Columbia defines children with SHCN as those who qualify for Supplemental Security Income (SSI) due to a disability. The Social Security Administration considers a child disabled if he/she has a physical or mental condition or conditions that can be medically proven and which result in marked and severe functional limitations; and the condition(s) must have lasted or be expected to last at least 12 months or end in death. Household income must also not exceed a threshold amount. The thresholds for earned income in 2004 were \$2,663 per month for a single-parent household with one child and \$3,227 per month for a two-parent household with one child. While SSI eligible children with disabilities represent only a segment of the population of children with special health care needs as defined by the Maternal and Child Health Bureau, children who qualify for SSI warrant closer examination because they tend to include the most severely disabled.

The District of Columbia's Medical Assistance Administration (MMA) contracts with Health Services for Children with Special Needs, Inc. (HSCSN) to administer a partially capitated MC option for children with SHCN who qualify for SSI. We provide a brief overview of this partially capitated MC option available to children with SHCN. The MMA pays HSCSN a monthly capitation fee for each enrolled child. HSCSN uses 20% of total capitation payments to cover administrative expenses, including case management services and outreach. The other 80% of total capitation payments are used to reimburse providers for services rendered and to cover transportation expenses for enrollees. If the total costs of medical and transportation services exceed the total amount of capitation payments set aside to cover such services, the MMA and HSCSN agree on a "settlement payment" to partially cover the difference between capitation payments received and reimbursements paid to providers and for transportation expenses. This reconciliation process typically occurs at the beginning of each calendar year. Thus, while HSCSN is at risk for their administrative expenses, case management and outreach services, they are not completely at risk for the direct costs of both medical and transportation services.

The HSCSN provider network includes only a small proportion of the providers who participate in the Medicaid program. Of the 3,266 physicians who participate in the Medicaid FFS program,

less than 110 participate in the HSCSN provider network. More than 40 dentists participate in FFS Medicaid, whereas less than ten are available to HSCSN enrollees. However, HSCSN will include any providers in its network who are willing to accept its contract. Provider reimbursement, in general, under HSCSN exceeds the amounts paid under Medicaid FFS. Under HSCSN, primary care providers, physician specialists, and dentists are reimbursed at rates that are about twice the amounts paid by Medicaid FFS. HSCSN and Medicaid FFS have similar rates for home health care services, therapy services and durable medical equipment.

An outreach worker is responsible for contacting the caregiver of each special needs child to inform the caregiver of the additional services and benefits that are available under the partially capitated managed care option. Providers have no role in recruiting eligible children to switch from FFS to the managed care option. Outreach workers are assigned to specific zip codes so they can become familiar with their communities. To locate many of these newly eligible children and establish trust, the outreach workers build relationships with providers and community organizations. When families are contacted and the benefits of HSCSN explained, they receive few turndowns.

HSCSN provides a comprehensive array of services for enrolled children including primary and specialty medical care, mental health, and an array of ancillary and support services. HSCSN contracts with a wide array of providers to deliver services to enrolled children. To coordinate services, each child enrolled in HSCSN is assigned a primary care physician (PCP) and case manager. Prior approval by the child's PCP or the HSCSN medical director is required for all health services with the exception of primary care, routine dental care, family planning, routine lab and radiology. ER visits are subject to utilization review. Case managers include registered nurses, social workers and other health care professionals who are licensed and have experience working with children and adolescents with special needs. Finally, the case manager, who serves as a link between the primary care physician, specialty providers and the family, monitors each child on an ongoing basis to assist the caregiver in making appointments, arranging for transportation, and obtaining needed services.

III. C. Sample Selection

C1. Characteristics of Children with Special Health Care Needs Enrolled in the DC Medicaid Program

Table 1 describes the characteristics of children with SHCN (as determined by eligibility for SSI) enrolled in the DC Medicaid program by plan type (FFS versus HSCSN). The special needs children enrolled in the DC Medicaid program grew by almost 30% between 1998 and 2001. In 1998, about 48% of special needs children ages two and older were enrolled in HSCSN. This percentage declined slightly in 1999 but then increased in subsequent years. In 2001, close to 52% of special needs children were enrolled in HSCSN.

Table 1. Special Needs Children Ages 2-18 Enrolled in DC Medicaid by Plan Choice

Sample	Number of Children by Plan Type and % of Total			
	1998	1999	2000	2001
All Special Needs Children	3,489	4,022	4,106	4,523
Special Needs Children in FFS	1,806 (51.8%)	2,159 (53.7%)	2,183 (53.3%)	2,188 (48.4%)
Special Needs Children in HSCSN	1,683 (48.2%)	1,863 (46.3%)	1,916 (46.7%)	2,335 (51.6%)

Source: Eligibility and Enrollment Records, DC Medical Assistance Administration

C2. Access to Care Survey: Characteristics of the Sample of Children with SHCN

The data for this component of the project were gathered from a telephone survey conducted with 1,088 caregivers of a random sample of children with SHCN enrolled in the DC Medicaid program. Close to 46% of FFS enrollees reported one or more unmet needs compared to 36.4% of HSCSN participants. Results from the baseline survey show that almost 20% of all children with SHCN experienced an unmet need for dental care. However, the percentage of FFS children who did not receive needed dental services was much larger than the percentage of children enrolled in HSCSN; 23% versus 17.3%, a 5.7 percentage point difference ($p < .02$). Of the 937 children whose caregivers completed the follow-up interview, 17.4% experienced an unmet need for dental care. Analysis of the follow-up data show that 18.9% of FFS children experienced an unmet need for dental care compared to 16.6% of children in HSCSN ($p < .05$).

III. D. Instruments Used

D1. Conceptual Framework and Hypotheses--Use of Services and Access to Care

In general, access to and use of both medical and dental care is affected by financial and non-financial factors. Because monetary costs of obtaining care are negligible for children enrolled in Medicaid, we anticipate that non-financial factors will be the major determinants of variation in access for this population. Our conceptual framework is a modified model of access to care developed by Andersen and Aday (1978). Access to care is determined by predisposing factors (demographic, social structure and parental attitudes and beliefs), enabling factors (family resources and health care resources in the community) and children's health care needs (Hughes, Johnson and Rosenbaum, 1999). Therefore, we hypothesize that children's access to and/or use of dental care will be dependent on type of plan (MC versus FFS), time and convenience factors, child health and dental needs, and parental demographic characteristics.

The effects of managed care versus FFS on access to and/or actual use of dental care are unclear because plan choice captures several factors. First, if the managed care plan has only limited numbers of pediatric dentists and dental specialists relative to those available under FFS, then one might expect to find a higher level of unmet need (lower level of use) for dental services among children enrolled in HSCSN. Second, access to and/or actual use of dental care may also

be affected by reimbursement rates. If dentists perceived the reimbursement rates for providing dental services to children with SHCN enrolled in Medicaid MC are too low relative to those paid under the FFS option, they will refuse to treat such children. If so, this will result in higher levels of unmet need for and/or lower use of dental services for those in managed care. On the other hand, if case managers assist parents/guardians in navigating the health care system, and these efforts mean that children obtain necessary dental care, then one would expect to find a lower level of unmet need (higher levels of use) among children enrolled in HSCSN. Thus, the effects of plan choice (FFS versus MC) on access to and use of dental services are ambiguous.

D.2. Model of Use of Dental Services, Controlling for Plan Choice

Table 2.1 defines the dependent and independent variables used in the estimation of the two equation models predicting plan choice and the probability that a special needs child received the specific dental treatment of interest during a given year. The indicators of utilization include whether the child had one or more visits during a given year for: 1) oral exams; 2) preventive services (dental prophylaxis and dental sealants); 3) restorative treatments (crowns, amalgams, and acrylics) and 4) specialized services (endodontics, periodontics, and oral surgery).

The independent variables in the plan choice equation ($HSCSN = 1, FFS = 0$) include the following: gender, age group, dummy variables measuring distance in miles between the child's place of residence and the nearest METRO stop, and whether the child ever had specific health conditions. Using the ICD-9 diagnosis codes reported on each claim, we constructed a series of dummy variables to indicate the presence or absence of specific chronic health conditions. These conditions are listed in Table 2.1.

In addition, model identification requires the plan choice equation include a set of instruments that affect plan choice but are unlikely to have any influence on the likelihood that a child has received the dental treatment of interest. The first variable that satisfies this condition is distance from the child's residence to the location of the nearest HSCSN primary care provider. We hypothesize that if a HSCSN primary care provider is within close proximity to the child's residence, the caregiver will be more likely to enroll the child in HSCSN. Thus, as distance from the child's place of residence to the nearest HSCSN primary care provider increases, we predict the child will be less likely to be enrolled in the partially capitated MC plan. The other two variables are designed to capture the amount of information about HSCSN that is available to caregivers of children with special needs. One variable is a count of the number of the number of special needs children who reside within 100 feet of the focal child. We anticipate that caregivers will be more likely to acquire knowledge about the additional benefits available under HSCSN, as well as the shortcomings of the FFS option, if they reside in close proximity to other special need children enrolled in the Medicaid program. The same rationale applies to the variable measuring the share of special needs children who are close neighbors of the focal child but who are also enrolled in HSCSN. Both of these variables are hypothesized to increase the likelihood that a caregiver opts to enroll the special needs child in the partially capitated MC plan. The set of instruments included in the plan choice equation are defined in Table 2.2.

Except for the set of instruments, which identify the plan choice equation, the year specific models predicting whether a child received the specific dental treatment of interest contains the

same set of explanatory variables as the plan choice specification. In addition, the dental use equations include a series of dummy variables to measure distance from the child's residence to the nearest dentist who accepts Medicaid patients. We hypothesize that the farther a child lives from a participating dentist, the less likely the child will be to receive dental services.

Table 2.1 Definitions of Variables for Use of Dental Services Models

Variable Name	Variable Definition
HSCSN	=1 if child is enrolled in HSCSN, the MC plan; =0 if child is enrolled in FFS
ORAL EXAM	=1 if child received at least one oral exam (dental checkup) during a specific year; = 0 if child did not.
PREVENTIVE SERVICES	=1 if child received at least one preventative service (sealants or prophylaxis) during a specific year; = 0 if child did not.
RESTORATIVE SERVICES	=1 if child received at least one restorative treatment (amalgam, acrylic or crown) during a specific year; =0 if child did not.
ENDOPERIOSURG	=1 if child received at least one endodontic, periodontic or oral surgical treatment during a specific year; =0 if child did not.
DENTIST DISTANCE ≤ 1 MILE	=1 if nearest dentist who accepts Medicaid is located 1 mile or less from child's place of residence; =0 otherwise (reference)
DENTIST DISTANCE >1 MILE & ≤ 3 MILES	=1 if nearest dentist who accepts Medicaid is located more than 1 mile but 3 miles or less from the child's residence; =0 otherwise
DENTIST DISTANCE >3 MILE & ≤ 5MILES	=1 if nearest dentist who accepts Medicaid is located more than 3 miles but 5 miles or less from the child's residence; =0 otherwise
DENTIST DISTANCE > 5 MILES	=1 if nearest dentist who accepts Medicaid is located more than 5 miles from the child's residence; =0 otherwise
METRO DISTANCE ≤ .5 MILE	=1 if nearest METRO stop is located within .5 mile from child's residence; = 0 otherwise (reference)
METRO DISTANCE > .5 BUT ≤1 MILE	=1 if nearest METRO stop is located between .5 and 1 mile from child's residence; = 0 otherwise
METRO DISTANCE > 1 MILE	=1 if nearest METRO stop is located more than 1 mile from child's residence; = 0 otherwise
FEMALE	=1 if special needs child is female; = 0 if male
AGE 2-5	=1 if child is between the ages of 2 and 5 inclusive; = 0 otherwise
AGE 6-8	=1 if child is between the ages of 6 and 8 inclusive; = 0 otherwise
AGE 9-12	=1 if child is between the ages of 9 and 12 inclusive; = 0 otherwise
AGE 13-18	=1 if child is between the ages of 13 and 18 inclusive; =0 otherwise
ADD	=1 if child ever diagnosed with attention deficit disorder; = 0 otherwise
ALLERGY	=1 if child ever diagnosed with allergies; = 0 otherwise
ANEMIA	=1 if child ever diagnosed with anemia; = 0 otherwise
ASTHMA	=1 if child ever diagnosed with asthma; = 0 otherwise
AUTISM	=1 if child ever diagnosed with autism; = 0 otherwise
BRONCHITIS	=1 if child ever diagnosed with bronchitis; = 0 otherwise
CEREBRAL PALSY	=1 if child ever diagnosed with cerebral palsy; = 0 otherwise

ECZEMA	=1 if child ever diagnosed with eczema; = 0 otherwise
EPILEPSY	=1 if child ever diagnosed with epilepsy; =0 otherwise.
EYE DISORDERS	=1 if child ever diagnosed with eye disorder; = 0 otherwise
HEARING PROBLEM	=1 if child ever diagnosed with hearing disorder; = 0 otherwise
HEART PROBLEM	=1 if child ever diagnosed with heart problem; = 0 otherwise
HIV	=1 if child ever diagnosed with HIV/AIDS; = 0 otherwise
HYPERTENSION	= 1 if child ever diagnosed with hypertension; = 0 otherwise
OTITIS MEDIA	=1 if child ever diagnosed with otitis media; = 0 otherwise
TOOTH DECAY	=1 if child ever diagnosed with tooth decay; = 0 otherwise

Table 2.2 Definitions of Variables Only Included in Plan Choice Equation

Variable Name	Variable Definition
DISTANCE TO NEAREST HSCSN PCP ≤ .5 MILE	=1 if nearest HSCSN primary care provider (PCP) is located within .5 mile from child's residence; = 0 otherwise (reference)
DISTANCE TO NEAREST HSCSN PCP >. 5 MILE BUT ≤ 1 MILE	=1 if nearest HSCSN primary care provider (PCP) is located between .5 and 1 mile from child's residence; = 0 otherwise
DISTANCE TO NEAREST HSCSN PCP > 1 MILE	=1 if nearest HSCSN primary care provider is located more than 1 mile from child's residence; = 0 otherwise
SPECIAL NEEDS KIDS WITHIN 100 FT	number of other special need children enrolled in the DC Medicaid program who reside within 100 feet of each special needs child
% HSCSN KIDS WITHIN 100 FT	% of special needs children enrolled in the DC Medicaid program who reside within 100 feet of special needs child and who are enrolled in HSCSN, the partially capitated MC plan.

D.3. Model of Access to Dental Services, Controlling for Plan Choice

We measured access as reported unmet need for dental care during the period covered by the two rounds of the caregivers' surveys. In both rounds, we asked caregivers if their child need dental services during the six months prior to the survey. If they indicated that their child need dental services we then asked if the child received the need dental service. If the caregiver indicated their child needed dental care during the past six months but did not receive services, we recorded their child as having an unmet need during that round. We created two dependent variables based on this information. The first was an ordered variable that indicated whether the child had 1) no unmet dental needs, 2) intermittent unmet dental needs and 3) persistent unmet dental needs. A child had no unmet dental needs if the caregiver reported no unmet needs in either round. A child had intermittent unmet dental needs if the caregiver reported an unmet dental need in either round one or round two. A child had persistent unmet dental needs if the caregiver reported an unmet dental need in both rounds. (See table 2.3)

The independent variable of interest is plan choice (FFS = 1, HSCSN = 0). The other variables in the model are measures of the child's health status (general health, functional status, mental

health status and dummy variables indicated whether the child had specific health conditions). We also included the caregivers' mental health status, age, educational attainment, and the household's income. (See table 2.3)

Table 2.3 Definitions of Variables in Access to Dental Services Model

Independent Variables	Definition
ANY UNMET DENTAL CARE NEED	equals 1 if the caregiver reported the child had an unmet need for dental care in the baseline or follow-up surveys; equals 0 if the caregiver reported no unmet need for dental care.
DEGREE OF UNMET DENTAL CARE NEED	equals 2 if the caregiver reported the child had an unmet need for dental care in both the baseline and follow-up surveys; 1 if the caregiver reported the child had an unmet need for dental care in either the baseline survey or follow-up survey but not both; equals 0 if the caregiver reported no unmet need for dental care.
FFS	equals 1 if child is enrolled in FFS; equals 0 if child is enrolled in HSCSN (partially capitated MC plan).
POOR HEALTH	equals 1 if caregiver reported child's health is either poor or fair; equals 0 if parent/guardian reported child's health is either good, very good or excellent.
PARS	measures the child's psycho-social adjustment. The PARS is a parent-reported measure of the disabled child's psycho-social functioning across six specific dimensions: peer relations, dependency, hostility, productivity, anxiety/depression and withdrawal.
ADL INDEX	reflects the child's ability to perform activities of daily living (ADLs). Questions regarding ADLs identify whether the child has difficulty 1) walking or running, 2) breathing, 3 seeing, and 4) hearing. We constructed an index by summarizing the responses to these four questions. Responses coded "Yes, A Lot" were assigned a value of 3, responses coded "Yes, A Little" were assigned a value of 2, and responses coded "NOT AT ALL" were assigned a value of 1.
CHRONIC CONDITION	equals 1 if the caregiver reported that the child has one or more of the following chronic conditions: asthma, bronchitis, tuberculosis, bone problem, heart condition, seizures, cancer, diabetes, sickle cell anemia, HIV-AIDS.
ACUTE CONDITION ^a	equals 1 if caregiver reported that the child has one or more of the following acute conditions: ear infections, meningitis, lead poisoning.
MENTAL CONDITION	equals 1 if caregiver reported that the child has one or more of the following mental health problems: developmental delay, anxiety disorder, depression, ADHD or other mental condition.
BIRTH DEFECT	equals 1 if caregiver reported that the child has one or more of the following birth defects: cystic fibrosis, autism, mental retardation, cerebral palsy, downs syndrome or genetic disorder.

THERAPY REQUIRED CONDITION	Equals 1 if caregiver reported that the child has one or more conditions that require therapy services: speech/language problem, hearing problem, eyesight problem, motor/physical problem.
OTHER CONDITION	equals 1 if caregiver did not report a specific condition.
CAREGIVER MENTAL HEALTH	measured by the 7-item version of the Center for Epidemiological Studies –Depression scale (CES-D).
YOUNG CAREGIVER	equals 1 if caregiver is under age 30; equals zero if child’s caregiver is over age 30.
MONTHLY INCOME	total monthly household income predicted from a regression equation to eliminate measurement
HIGH SCHOOL GRADUATE ^a	equals 1 if the caregiver has a high school diploma; equals 0 otherwise.
SOME COLLEGE ^a	equals 1 if the caregiver has some college; equals 0 otherwise.
COLLEGE PLUS ^a	Equals 1 if the caregiver has attained schooling beyond a college degree; equals 0 otherwise.

Similar to the dental use analyses, plan choice is treated as endogenous in the access to dental care analyses. To identify plan choice equation, we used variables that predict plan choice but not unmet dental need. We used instruments described in the use analysis and two additional ones: 1) whether the caregiver and the special needs child have the same last name; 2) a set of dummy variables which indicate the importance of having the special needs child use the same doctor or hospital as other family members; rated as either important, not important, or neutral in selecting a plan. We expect that the managed care plans’ outreach department would have greater success contacting caregivers who have the same last name as the child. For nearly three fourths of the enrollees, the DC Medicaid enrollment records did not contain the parents or caregivers’ name. We contend that if the managed care plan’s outreach department called the home or sent a letter to the home of an eligible child, they would have more success in reaching the caregiver responsible for the child if the caregiver and the child had the same last name. If so, we expect that the caregiver will be more likely enroll their child in the MC option. With regard to the second instrumental variable, if caregiver indicated it is important that the special needs child be able to see the same doctor or go to the same hospital as other family members, we expect the child will be more likely to remain in the FFS option. This is because the MC option has a much smaller network of providers than the provider network available to children enrolled in FFS.

Table 2.4 - Instrumental Variables in Plan Choice Equation -- Access to Dental Services

CAREGIVER’S AND CHILD’S LAST NAMES MATCH	equals 1 if the caregiver’s and child’s last names match; equals 0 if caregiver’s and child’s last name do not match.
SAME FAMILY IMPORTANT ^b	equals 1 if it was important to the caregiver that the special needs child be able to see the same physician or use the same hospital as other family members; equals 0 otherwise.

SAME FAMILY NEUTRAL ^b	equals 1 if it was neutral to the caregiver that the special needs child be able to see the same physician or use the same hospital as other family members; equals 0 otherwise.
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III. E. Statistical Techniques Employed

E.1 Use of Dental Services Analysis

Caregivers can choose to enroll their special needs child in either FFS or the partially capitated MC plan. We anticipate that the characteristics of children with SHCN who voluntarily enroll in the partially capitated MC plan will differ from those who opt to remain in the FFS system. If some of these differences are unobservable and affect use of dental services, our analysis may be subject to endogeneity or sample selection bias. We estimate a treatment effects model that accounts for the binary nature of both the plan choice and outcome variables, and allows for the possibility that unobserved selection may influence the estimated impact of plan choice on the probability a child receives the dental service of interest (Heckman and Hotz 1989; Meyer 1995).

The probability of enrolling in HSCSN versus FFS is specified as:

$$\Pr(\text{HSCSN} = 1) = \Pr(Z\delta + \upsilon > 0),$$

and the probability of receiving a specific dental treatment in a given year is specified as:

$$\Pr(\text{COMPLIANCE} = 1) = \Pr(X\beta + \alpha \text{HSCSN} + \varepsilon > 0),$$

where Z and X represent observable characteristics that are independent of (υ, ε) and Z contains at least one variable that is not in X ; δ , β , and α are parameters to be estimated; and υ and ε are random error terms. The assumption that υ and ε are distributed bivariate normal with $E(\upsilon) = 0$, $E(\varepsilon) = 0$, $\text{Var}(\upsilon) = 1$, $\text{Var}(\varepsilon) = 1$, and $\text{Cov}(\upsilon, \varepsilon) = \rho$ (rho) allows for the possibility that the residuals of the plan choice equation may be correlated with the residuals from the equation predicting whether a child received a specific dental treatment. If rho is positive and significant, this indicates that children with a greater propensity to enroll in HSCSN, the partially capitated MC plan, are also more prone to be receive the particular dental service. This could occur for example if highly educated caregivers are more likely to enroll their child in the partially capitated MC plan and more apt to ensure their child receives the recommended dental visits. On the other hand, if rho is insignificant, this means that non-random selection due to unobservables does not exist. After controlling for potential non-random selection associated with plan choice, the coefficient on the HSCSN variable measures the program effect, that is, the difference in the probability of receiving a particular dental treatment that exists between HSCSN and FFS enrollees.

Controlling for non-random selection due to unobservables is contingent on identifying a set of instruments that predict plan choice but at the same time are unrelated to whether a child in a specific age group receives the recommended number of well child care visits. The set of instruments we employ to identify the plan choice equation include: 1) distance from the child's residence to the office location of the nearest HSCSN primary care provider, 2) number of

special needs children enrolled in the DC Medicaid program who reside within 100 feet of the child of interest; and 3) the ratio of the number of HSCSN children who reside within 100 feet of the focal child to the total count of special needs children enrolled in Medicaid who reside within 100 feet of the focal child. The rationale for using these variables as instruments to identify the plan choice equation is described in the model specification section.

Recognizing that instrument validity is critical if one is to eliminate selection bias linked to plan choice, we perform two tests to evaluate the relevance and validity of the instruments. Relevance implies that our instruments are good predictors of plan choice. The first involves estimating the plan choice equation with and without the set of instruments and then testing whether the set of instruments are jointly equal to zero. We test to see if both the χ^2 measuring goodness of fit and the pseudo R^2 for the model that contains the instruments are significantly higher than the corresponding statistics for the model without the instruments (Bound, Baker and Jaeger 1995; Staiger and Stock 1997). Validity requires that the instrument be orthogonal to or uncorrelated with the residuals from the second stage equation predicting whether the child has received the dental treatment of interest. To test whether this orthogonality condition holds, we regress each compliance indicators on the dummy variable identifying plan choice, the other exogenous variables that are hypothesized to influence use of services and the set of instruments. We then conduct a χ^2 test to determine if the coefficients of the instruments are jointly equal to zero (Davidson and MacKinnon, 1993). If the instruments jointly have no effect, this means the instruments are uncorrelated with the residuals in the second stage equations predicting the child received a particular type of dental service.

E.2 Access to Dental Services Analysis

Similar to the analysis described above, we had to adjusting for endogenous of plan choice in the access to dental services analysis. We employed two techniques: 1) a two-step estimation procedure outlined by Woolridge (2002) to control for the potential non-random selection bias associated with plan choice and 2) bivariate probit estimation. We used the two-step estimation procedure to estimate the effect of plan choice on degree of unmet dental care need. This two-step procedure involved first estimating a probit model of plan choice and using the predicted value from this model to construct a residual for each child in the sample. We then included this residual as a correction factor in the second stage equation predicting access to dental care.

The probability that a child had no unmet dental need, intermittent unmet dental need, or persistent unmet dental care need was expressed as a function of plan choice, individual characteristics, a correction factor and an unobservable error term. If the coefficient on the correction, is statistically significant, then this implies that there are unobservable factors that influence plan choice that if ignored could bias the effect of plan choice on the probability that child has unmet dental care need. By purging the model of the potential selection bias associated with plan choice, the coefficient on the plan choice variable is unbiased. We also compared the results from this technique to those using the two-step Heckman correction. We used bivariate probit to estimate the effect of plan choice on any unmet dental need.

IV. Findings

IV.A. Descriptive Comparisons—Receipt of Specific Dental Treatments by Plan Choice

The null hypothesis underlying our bivariate comparisons is that no relationship exists between plan type and the dichotomous indicators measuring whether the special needs child received the specific dental treatment of interest. We used 2-by-2 contingency table analysis to evaluate if there is a systematic relationship between the dental treatment of interest and plan choice while controlling for time period. Tables 3.1 through 3.4 show these bivariate comparisons for receipt of oral exams, receipt of preventive services, receipt of restorative treatments and receipt of specialized services (endodontics, periodontics, or oral surgery), respectively.

As shown in Table 3.1, in 1998, almost 25% of special needs children enrolled in HSCSN received an oral exam compared to less than 9% of FFS participants ($p < .01$). The percentage of HSCSN children who received an oral exam increased sharply to almost 34% during 1999, but then fell slightly in 2000 and dropped further to below 24% by 2001. In contrast, the percentage of FFS children who received oral exams declined to 5.5% by 2001. Without controlling for other factors, the odds that a special needs child enrolled in HSCSN received an oral exam throughout this time period was almost 3 to 5.5 times higher than the FFS child.

Table 3.1 Percentage of Special Needs Children Who Received Oral Exam by Plan Choice

YEAR	No. of Children & % of Total Who Received Oral Exam	No. of HSCSN Children & % of Total Who Received Oral Exam	No. of FFS Children & % of Total Who Received Oral Exam
1998	3,535 (16.4%)	1,685 (24.9%)**	1,850 (8.7%)**
1999	4,077 (18.7%)	1,865 (33.6%)**	2,212 (6.1%)**
2000	4,166 (17.8%)	1,918 (31.8%)**	2,248 (5.9%)**
2001	4,603 (14.8%)	2,337 (23.8%)**	2,266 (5.5%)**

Note: **Difference between percentage of children who received dental treatment of interest by plan choice are significant ($p < .01$).

Table 3.2 shows the percentage of special needs children who received preventive services during a given year controlling for plan choice. Irrespective of plan choice, the percentage of children who received preventive services declined from about 27% in 1998 to 20% in 2001. In 1998, 42% of HSCSN participants received preventive services compared to about 13% of FFS enrollees ($p < .01$). The chances of receiving preventive services declined over time for both groups, although the absolute magnitude of the decrease was larger for HSCSN enrollees. By 2001, only 9% of FFS participants and less than 31% of HSCSN enrollees received preventive dental services ($p < .01$). Over this time period, special needs children in the managed care plan were 3.2-3.4 times more likely to receive preventive dental care compared to their FFS counterparts ($p < .01$).

Table 3.2 Percentage of Special Needs Children Who Received Preventive Dental Care by Plan Choice

YEAR	No. of Children & % of Total Who Received Preventive Care	No. of HSCSN Children & % of Total Who Received Preventive Care	No. of FFS Children & % of Total Who Received Preventive Care
1998	3,535 (26.8%)	1,685 (42.0%)**	1,850 (12.9%)**
1999	4,077 (24.1%)	1,865 (38.5%)**	2,212 (11.9%)**
2000	4,166 (21.9%)	1,918 (35.1%)**	2,248 (10.6%)**
2001	4,603 (20.0%)	2,337 (30.6%)**	2,266 (9.0%)**

Note: **Difference between percentage of children who received dental treatment of interest by plan choice are significant (p<.01).

As shown in Table 3.3, only a small percentage (5.4%) of all special needs children received restorative dental treatments in 1998 and by 2001 the use rate was 4.1%. Nevertheless, use rates were significantly lower for FFS children. For example, in 1998, 8.3% of HSCSN participants received restorative dental care compared to less than 3% of FFS enrollees (p<.01). By 2001, the use rates were 6.3% for HSCSN participants but less than 2% for FFS enrollees (p<.01). Without adjusting for other factors, special need children enrolled in HSCSN, throughout this time period, were 3 to 3.5 times more likely to receive restorative dental treatments compared to FFS enrollees (p<.01).

Table 3.3 Percentage of Special Needs Children Who Received Restorative Dental Treatments by Plan Choice

YEAR	No. of Children & % of Total Who Received Restorative Care	No. of HSCSN Children & % of Total Who Received Restorative Care	No. of FFS Children & % of Total Who Received Restorative Care
1998	3,535 (5.4%)	1,685 (8.3%)**	1,850 (2.8%)**
1999	4,077 (4.7%)	1,865 (7.4%)**	2,212 (2.4%)**
2000	4,166 (4.9%)	1,918 (7.9%)**	2,248 (2.3%)**
2001	4,603 (4.1%)	2,337 (6.3%)**	2,266 (1.8%)**

Note: **Difference between percentage of children who received dental treatment of interest by plan choice are significant (p<.01).

Finally, we examine differences in use rates of specialized dental treatments --endodontics, periodontics and oral surgery—(EPOS) by plan type (see table 3.4). As was the case with restorative care, rates of use of EPOS treatments were low irrespective of plan choice. Only 5.4%

of all special needs children received EPOS treatments in 1998 and this percentage declined to 4% by 2001. Rates of use declined among HSCSN enrollees from 8.3% in 1998 to 6.3% in 2001, while among FFS participants the use rate fell from 2.8% to 1.7%. Despite the low rates of use, the unadjusted odds that special needs children enrolled in HSCSN received EPOS treatments during this time period was 2.5 to 3.7 times as much as their FFS counterparts ($p < .01$).

Table 3.4 Percentage of Special Needs Children Who Received Endodontics, Periodontics, or Oral Surgery (EPOS) Treatments by Plan Choice

YEAR	No. of Children & % of Total Who Received EPOS Treatment	No. of HSCSN Children & % of Total Who Received EPOS Treatment	No. of FFS Children & % of Total Who Received EPOS Treatment
1998	3,535 (5.4%)	1,685 (8.3%)**	1,850 (2.8%)**
1999	4,077 (3.4%)	1,865 (5.7%)**	2,212 (1.5%)**
2000	4,166 (3.7%)	1,918 (5.6%)**	2,248 (2.2%)**
2001	4,603 (4.0%)	2,337 (6.3%)**	2,266 (1.7%)**

Note: **Difference between percentage of children who received dental treatment of interest by plan choice are significant ($p < .01$).

IV.B. Results Predicting Plan Choice

Table 4.1 contains the year specific regression estimates for the set of instruments predicting plan choice. These results are based on the bivariate probit regression model where plan choice and receipt of dental preventive services are jointly estimated. The plan choice results from the bivariate models predicting receipt of oral exams, receipt of restorative services and EPOS treatments are not reported because they are almost identical to the plan choice parameters for the model of plan choice and receipt of preventive services. In each year specific regression predicting plan choice, we find that the presence of specific health conditions increases the likelihood that the special needs child is enrolled in the partially capitated MC plan. Age is another significant predictor of plan choice, as younger children are significantly less likely to be enrolled in HSCSN compared to older special needs children ($p < .01$). Our primary focus, however, is on the set of instruments that are critical to obtaining an unbiased estimate of the effect of plan choice on the indicators measuring receipt of preventive dental services. Consistent with expectations, we find that with few exceptions, as distance to the nearest HSCSN primary care provider increases, the child is less likely to be enrolled in HSCSN. Second, as anticipated, the number of special needs children enrolled in the DC Medicaid program who reside in close proximity to the focal child has a significant positive impact on the probability the focal child is enrolled in HSCSN. Third, the share of special needs children who reside in close proximity and who are enrolled in the MC plan significantly increases the likelihood that the focal child participates in HSCSN.

Table 4.1 Regression Estimates for the Set of Instruments Predicting Plan Choice (HSCSN =1)
(Based on Bivariate Probit Model Predicting Plan Choice and Receipt of Preventive Services)

Variable	1998	1999	2000	2001
DISTANCE TO NEAREST HSCSN PCP >. 5 MILE BUT ≤ 1 MILE	-.197*** (.049) [-.078]	-.193*** (.046) [-.076]	-.289*** (.046) [-.114]	-.299*** (.044) [-.119]
DISTANCE TO NEAREST HSCSN PCP > 1 MILE	-.296*** (.086) [-.116]	-.212*** (.081) [-.182]	-.271*** (.082) [-.106]	-.310*** (.080) [-.122]
SPECIAL NEEDS KIDS WITHIN 100 FT of FOCAL CHILD	.060*** (.005) [.024]	.052*** (.004) [.021]	.077*** (.004) [.030]	.084*** (.004) [.034]
% HSCSN KIDS WITHIN 100 FT of FOCAL CHILD	.605*** (.104) [.241]	.650*** (.097) [.258]	.547*** (.099) [.217]	.689*** (.094) [.275]

***Significant at $p < .01$. Results reported are probit coefficients, standard errors in parentheses and marginal effects in brackets.

We conducted the necessary statistical tests to evaluate the validity of the instruments. These results are reported in Table 4.2.

Table 4.2 Results from Tests for Instrument Validity

Type of Service	YEAR	Instruments Uncorrelated with Use of Dental Care	Type of Service	YEAR	Instruments Uncorrelated with Use of Dental Care
Oral Exam	1998	YES, $X^2=1.33$ ($p=.856$)	Restorative Treatments	1998	YES, $X^2=.64$ ($p=.959$)
Oral Exam	1999	YES, $X^2=2.70$ ($p=.608$)	Restorative Treatments	1999	YES, $X^2=4.61$ ($p=.329$)
Oral Exam	2000	YES, $X^2=4.31$ ($p=.365$)	Restorative Treatments	2000	YES, $X^2=3.58$ ($p=.465$)
Oral Exam	2001	YES, $X^2=2.38$ ($p=.666$)	Restorative Treatments	2001	YES, $X^2=7.23$ ($p=.124$)
Preventive Care	1998	NO, $X^2=9.12$ ($p=.058$)	EPSO Treatments	1998	YES, $X^2=6.22$ ($p=.183$)
Preventive Care	1999	NO, $X^2=12.31$ ($p=.015$)	EPSO Treatments	1999	YES, $X^2=4.84$ ($p=.304$)
Preventive Care	2000	YES, $X^2=6.68$ ($p=.154$)	EPSO Treatments	2000	NO, $X^2=11.02$ ($p=.026$)
Preventive Care	2001	YES, $X^2=7.19$ ($p=.126$)	EPSO Treatments	2001	NO, $X^2=2.52$ ($p=.641$)

We find that for each of bivariate models of plan choice and use we estimated the set of instruments are highly significant predictors of plan choice. The second condition for strong

instrument validity requires that the instruments are uncorrelated with each year specific indicator of dental use; this requirement is typically the more difficult condition to satisfy. The results in Table 4.2 show that for 13 of the 16 year specific indicators of use, the instruments satisfy the second condition required for instrument validity. This condition fails for the models predicting receipt of preventive care in 1998 and 1999 and for receipt of EPSO treatments in the year 2000.

IV.C. Second Stage Probit Predicting Receipt of Specific Dental Treatments

Tables 5.1 thru 5.4 report marginal impacts from the second stage probit models predicting the effects of plan choice and proxies for geographic convenience on use of specific dental treatments over the time period 1998-2001. The marginal impact represents the percentage point change in the probability of receiving the particular dental treatment associated with the right-hand side variable of interest. We also report rho which measures the effects of selection due to unobservables. Although not reported in Tables 5.1-5.4, the presence of specific chronic conditions significantly increases the probability that a special needs child obtains the dental treatment of interest ($p < .01$). In contrast, age and gender do not influence the likelihood that a special needs child receives any of the dental treatments of interest.

As shown in Table 5.1, enrollment in HSCSN rather than FFS increases the likelihood that a special needs child receives an oral exam in a given year by 15 to 29 % points ($p < .01$). In the model based on year 2000 data, having to travel more than 5 miles to the dentist reduces the probability that a special needs child receives an oral exam by close to 11% points ($p < .01$). Otherwise travel distance to the dentist does not impact whether a child has an oral exam. On the other hand, having ready access to the METRO in DC does significantly influence whether a special needs child receives a dental check-up. Children who reside more than one mile from a METRO stop are 3.8 to 4.7% points less likely to receive the recommended oral exam ($p < .01$). Rho is highly significant implying there is no selection due to unobservable factors that might bias the effects of variables included in the model.

Table 5.1 Marginal Effects of Plan Choice and Geographic Convenience Indicators on Receipt Of Oral Exam Controlling for Year

Variable	1998	1999	2000	2001
PLAN CHOICE (HSCSN =1)	.157***	.254***	.292***	.146***
DENTIST DISTANCE >1 MILE & ≤ 3 MILES ^a	-.012	-.003	-.011	.006
DENTIST DISTANCE >3 MILE & ≤ 5MILES ^a	.021	.047	-.070	-.047
DENTIST DISTANCE > 5 MILES ^a	-.055	-.025	-.106***	.017
METRO DISTANCE > .5 BUT ≤1 MILE	-.018	-.007	-.011	-.019**
METRO DISTANCE > 1 MILE	-.038**	-.047***	-.043***	-.039***

RHO-measures unobservables due to non-random selection	-.016 (p=.864)	.015 (p=.821)	-.152 (p=.081)	.047 (p=.562)
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***Significant at $p < .01$; **Significant at $.01 < p \leq .05$. Marginal effects represent the percentage point change in the probability that the child receives the dental treatment of interest.

Table 5.2 reports the marginal effects of plan choice and the variables measuring geographic convenience on whether a special needs child receives preventive dental care during a given year. Enrollment in HSCSN as opposed to FFS increases the probability that a special needs child receives preventive dental care by 29 to 32 % points during the years 1998-2000, but the magnitude of the difference between the two plans drops to 18.7% points in 2001 ($p < .01$). Children who reside more than 5 miles from a participating dentist are about 11% points less likely to obtain preventive dental care ($p < .01$), but this was only the case for the years 1998 and 2000. Consistent with the results for the receipt of oral exams, children who reside more than one mile from a METRO stop are 3.3 to 5.5 % points less likely to obtain preventive dental treatments relative to those who reside closer to the subway ($p < .01$). Except for the specification based on year 2000 data, there is no evidence of selection bias due to unmeasurable factors.

Table 5.2 Marginal Effects of Plan Choice and Geographic Convenience Indicators on Receipt Preventive Dental Care Controlling for Year

Variable	1998	1999	2000	2001
PLAN CHOICE (HSCSN =1)	.322***	.323***	.287***	.187***
DENTIST DISTANCE >1 MILE & \leq 3 MILES ^a	-.001	.013	-.019	.002
DENTIST DISTANCE >3 MILE & \leq 5MILES ^a	-.025	.0003	-.094	-.018
DENTIST DISTANCE > 5 MILES ^a	-.114***	-.055	-.108***	-.014
METRO DISTANCE > .5 BUT \leq 1 MILE	-.025	.004	-.028**	-.004
METRO DISTANCE > 1 MILE	-.050**	-.055***	-.047***	-.033**
RHO-measures unobservables due to non-random selection	-.113 (p=.208)	-.174 (p = .069)	-.167** (p=.038)	.015 (p=.830)

***Significant at $p < .01$; **Significant at $.01 < p \leq .05$. Marginal effects represent the percentage point change in the probability that the child receives the dental treatment of interest.

Plan choice significantly affects the receipt of restorative dental treatments in three of the four year specific models (Table 5.3). Participants in HSCSN are 3 to 4.6% points more likely than their FFS counterparts to undergo restorative dental treatments ($p < .01$). Residing more than 5 miles from a dentist who accepts Medicaid reduces the probability that a child receive restorative treatments by 3.7% points in 1999 and 3.4% points in 2000 ($p < .01$). Living more than a half mile from a METRO stop has a negative impact on whether a child receives restorative care but only in 1998 ($p < .01$). Consistent with the results for oral exams and receipt of preventive care,

selection attributable to unobservable factors has negligible effects on the probability a special needs child receives restorative treatments.

Table 5.3 Marginal Effects of Plan Choice and Geographic Convenience Indicators on Receipt of Restorative Dental Treatments Controlling for Year

Variable	1998	1999	2000	2001
PLAN CHOICE (HSCSN =1)	.028	.046***	.042***	.030**
DENTIST DISTANCE >1 MILE & ≤ 3 MILES ^a	.006	.005	.001	.001
DENTIST DISTANCE >3 MILE & ≤ 5 MILES ^a	-.025	-.003	-.030***	.018
DENTIST DISTANCE > 5 MILES ^a	-.028	-.037***	-.034***	.0001
METRO DISTANCE > .5 BUT ≤1 MILE	-.015**	-.007	-.006	.004
METRO DISTANCE > 1 MILE	-.021**	.0002	-.006	-.001
RHO-measures unobservables due to non-random selection	.032 (p=.815)	-.159 (p=.375)	-.111 (p=.426)	.019 (p=.878)

***Significant at $p < .01$; **Significant at $.01 < p \leq .05$. Marginal effects represent the percentage point change in the probability that the child receives the dental treatment of interest.

Table 5.4 displays the marginal effects of plan choice and variables measuring geographic convenience on the probability that a special needs child receives endodontic, periodontics, or oral surgery (EPOS) controlling for year. HSCSN participants are 2.6 to 5.1% points more likely than FFS enrollees to obtain EPOS treatments ($p < .01$). The need to travel longer distances to see a dental provider does impede the likelihood that a special needs child obtain EPOS treatments, although the pattern of results is not consistent across the years. Residing more than one mile from the nearest METRO stop negatively affects whether a special needs child obtains EPOS services but only in the year 1998 ($p < .01$). Finally, we find no evidence of selection due to unobservables.

Table 5.4 Marginal Effects of Plan Choice and Geographic Convenience Indicators on Receipt of Endodontics, Periodontics, or Oral Surgery (EPOS) Controlling for Year

Variable	1998	1999	2000	2001
PLAN CHOICE (HSCSN =1)	.051***	.035***	.026***	.038***
DENTIST DISTANCE >1 MILE & ≤ 3 MILES ^a	.007	.002	.001	-.001
DENTIST DISTANCE >3 MILE & ≤ 5MILES ^a	.020	-.027***	-.025***	.015
DENTIST DISTANCE > 5 MILES ^a	-.016	-.009	-.028***	-.009

METRO DISTANCE > .5 BUT ≤1 MILE	-.003	-.0002	-.003	-.004
METRO DISTANCE > 1 MILE	-.028***	-.007	-.004	-.003
RHO-measures unobservables due to non-random selection	-.115 (p=.397)	-.059 (p=.722)	-.085 (p=.454)	-.029 (p=.795)

***Significant at $p < .01$; **Significant at $.01 < p \leq .05$. Marginal effects represent the percentage point change in the probability that the child receives the dental treatment of interest.

IV.D. Results—Access to Dental Care

Results from the baseline and follow-up surveys show that 29% of all children with SHCN experienced an unmet need for dental care. However, the percentage of FFS children who did not receive needed dental services was much larger than the percentage of children enrolled in HSCSN; 23% versus 17.3%, a 5.7 % point difference ($p < .02$). Of the 937 children whose caregivers completed the follow-up interview, 17.4% experienced an unmet need for dental care. Analysis of the follow-up data show that 18.9% of FFS children experienced an unmet need for dental care compared to 16.6% of children in HSCSN ($p < .05$).

The first dependent variable we analyzed is the probability of reporting any unmet need for dental care. The results show that after controlling for the potential selection bias linked to plan choice, enrollment in FFS relative to HSCSN increased the likelihood that a special needs child experienced an unmet need for dental care by 13.6% points ($p < .05$). This represents as about 44% increase relative to the predicted mean of 29.1%.

The second dependent variable we analyzed measures whether there is intermittent or persistent unmet need for dental care between the baseline and follow-up interviews. Results from the ordered probit estimation show that after controlling for the potential selection bias associated with plan choice, enrollment in the FFS moves a special needs child in the direction of having persistent unmet need for dental care. The coefficient on the FFS variable is -.330 but only borderline statistically significant ($p = .055$). Because the coefficients from an ordered probit estimation cannot be interpreted directly, we predicted the marginal effect of plan on having intermittent or persistent unmet need for dental care. Enrollment in FFS relative to HSCSN increased the likelihood that a special needs child had intermittent unmet need for dental care by 7.5 % points ($p = .053$) and persistent unmet need for dental care by 4.0 % points ($p = .075$). These findings suggest that access to dental services could be significantly improved if all special needs children were enrolled in HSCSN, the partially capitated managed care plan.

V. Discussion and Interpretation of Findings

V.A. Conclusions

Our analyses of Medicaid claims show that children with SHCN enrolled in a partially capitated MC plan are significantly more likely to be receive oral exams, preventive dental services, restorative dental treatments and EPOS compared to their FFS counterparts. Further, we find that having ready access to the METRO in DC does significantly influence whether a special needs child receives dental care. For example, children who reside more than one mile from a METRO stop are 3.8 to 4.7%

points less likely to receive recommended check-ups ($p < .01$). Moreover, we find that selection due to unobservable characteristics such as caregiver's education and health status does not significantly bias the estimated program effects associated with plan enrollment. Additional analyses of unmet dental need based on a survey of caregivers of special needs children enrolled in the DC Medicaid program support our findings of use based on Medicaid claims. Specifically, we find that HSCSN participants have better access to care and fewer unmet dental needs than children enrolled in FFS, yet non-random selection due to unobservable factors is negligible.

V.B. Study Limitations

While these findings highlight the potential benefits that can be achieved from enrolling special needs children in a partially capitated MC plan, our analysis have some limitations. First, nearly all special needs children enrolled in the DC Medicaid program are African American, so our findings may not be applicable to whites and other minorities. Second, our study focuses on a Medicaid program that operates in the center city of a large metropolitan area, so our findings may not be representative of those who reside in suburban or rural areas. Third, analysis of claims data has inherent limitations in that we have no information about the caregiver who makes the decision about plan enrollment. Third, we lack sufficient data on each child's dental health status. Such information is needed to ascertain the appropriate level of services required to meet each child's dental health care needs. Finally, our analyses only examine the segment of special needs children which qualify for SSI.

V.C. Comparison of Findings with Other Studies

This study is the first to compare access to and use of dental care services for special needs children under Medicaid FFS versus a Medicaid MC approach. Similar to other studies that have examined policy changes designed to improve access to dental care, we find that a MC approach significantly increases the likelihood that special needs children receive recommended dental treatments.

V.D. Possible Application of Findings to Actual MCH Health Care Delivery Systems

Our findings suggest that incorporating specific components of the Medicaid MC approach that is available for SSI eligible disabled children in DC has the potential to significantly reduce unmet needs and ensure that this vulnerable population receives recommended dental treatments. The specific characteristics of the DC Medicaid MC program that merit consideration include ongoing case management and higher reimbursement rates paid to dental providers.

V.E. Policy Implications

Our findings have important implications for the delivery of dental care to low income children enrolled in state Medicaid programs. First, irrespective of plan enrollment, use of dental services among special needs children is abysmally low. The reasons for low use of dental services among children enrolled in Medicaid need to be addressed because lack of appropriate dental care may result in serious health problems and even premature death. The recent tragic death of a 12 year old boy in Prince Georges county Maryland in February 2007 demonstrates the importance of providing adequate dental coverage for low-income children. State Medicaid programs could achieve this goal by implementing a MC option that incorporates ongoing case management coupled with adequate reimbursement rates for dental providers. Second, efforts to

expand the dental network available under Medicaid programs have the potential to ensure that low-income children receive needed dental care.

V.F. Suggestions for Further Research

Future research should focus on the following questions:

- 1) Do managed care programs that exist in other states improve access to and use of dental care among special needs children in Medicaid?
- 2) Do higher reimbursements to dental providers result in greater access and improvements in use of recommended dental treatments for children with special health care needs?
- 3) Does a managed care approach improve access to and encourage use of recommended dental care among non-disabled low-income children enrolled in Medicaid?
- 4) Does unmet dental needs result in greater morbidity and higher Medicaid expenditures that could have been avoided if the child received appropriate dental care?

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