Care coordination and unmet need for specialised health services among children with special healthcare needs in the USA: results from a cross-sectional analysis of the national survey of children with special healthcare needs

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ABSTRACT

Objective To report rates of need and unmet need for specialised health services (occupational and speech therapies, durable medical equipment, home healthcare, and mobility and communication aids) from the National Survey of Children with Special Health Care Needs (CSCHN) (2009/2010) and assess the role of care coordination in having needs met. We distinguish between CSHCN with and without emotional, behavioural and developmental disorders (EBDPs) in the USA.

Design A cross-sectional cohort study of a nationally representative sample of CSHCN from the National Survey of CSHCN for 2009/2010 used logistic regression to assess the relationship between EBDPs and need and unmet need for specialised services. It also estimates the association of care coordination with unmet need for all services, for CSHCN with and without EBDPs.

Setting A nationally representative sample of CSHCN in the USA.

Participants Children ages 0–17 years of age.

Results Across all specialised health services, rates of unmet need were at or below 25%. Need and unmet need for most services was higher among CSHCN with EBDPs than those without. For CSHCN with and without EBDPs, adequate care coordination was associated with greater probability of having needs for therapy, home health and communication aids met.

Conclusion Care coordination is essential to reducing barriers to a wide range of healthcare services for CSCHN. Policies requiring adequate insurance coverage for care coordination may play a critical role in ensuring access to specialised health services.

INTRODUCTION

Children with special healthcare needs (CSCHN) have a persistent physical, developmental, behavioural or emotional condition that requires the use of health and other support services at greater rates than the majority of other children. While there is a spectrum of healthcare needs and disability among CSHCN in the USA, over 40% of CSHCN report two or more chronic medical, emotional, developmental or behavioural conditions.

Almost all CSHCN experience impairment in completing the activities of daily living. Nearly half of CSHCN experience four or more functional impairments including difficulties in self-care, challenges with coordination, difficulties in learning, behaviour, speaking or communicating, and feeling anxious or depressed. To improve health and prolong life, CSHCN require a wide array of specialised health services to address these limitations. Such services may include speech, occupational or physical therapy (ST, OT, PT), home healthcare, mental healthcare and specialist healthcare. Rates of unmet service needs vary significantly across service types in the USA, with as few as 6% of CSHCN going with unmet need for vision

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STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This research uses the most recent, nationally representative data to understand the need and unmet need for rarely examined, highly specialised services among children with special healthcare needs (CSCHN).

⇒ This study identifies the key role of care coordination in accessing specialised health services for CSHCN.

⇒ This study used caregiver reported data and their perception of need and unmet need for specialised health services.
care but nearly 25% having an unmet need for communication assistance.5

Multiple factors place CSHCN at increased risk for unmet healthcare needs. Greater functional impairment,6 presence of emotional, behavioural or developmental disorders (EBDPs),7 8 lower family income,9 lack of a usual care provider or medical home,3 and public health insurance or lack of health insurance are associated with greater rates of unmet healthcare needs.9 Care coordination increases access to necessary services and community support and can allow families to raise their CSHCN with significant medical, behavioural or developmental complexities at home.10 11

CSHCN experiences with specialised healthcare

US national estimates of the need for a wide range of health services, rates of met needs, and factors associated with need and unmet need among CSHCN have been studied broadly for the last 20 years. This research has commonly examined differences across subgroups of CSHCN, particularly focusing on those with EBDPs9 12 13: children with autism spectrum disorders,3 mental health disorders,14 developmental or intellectual disabilities8 15 or comorbid conditions.9 These studies examined the differences in experiences related to access to specialty care,4 mental healthcare,5 therapy,5 15 medical homes,13 and other preventative and routine care.14 15 8 11 15 However, existing research mostly omits examination of the most highly specialised services used by CSHCN. Rarely examined are need and unmet need for OT, ST or PT, mobility, communication or vision aids, and home healthcare. Though these services have much lower need and utilisation rates—even for CSHCN with the most complex conditions—they are critical to maintaining children with the most disabling conditions and functional impairments in their homes and communities rather than in institutionally based care.16 Further, no studies exist that use nationally representative data examining the role of care coordination in accessing these specialised health services.

The current study seeks to answer the following research questions to address these gaps in knowledge. Specifically, in diverse populations of CSHCN in the USA: (1) What is the rate of need and unmet need for specialised health services for CSHCN? (2) How do rates of need and unmet need for each service differ between CSHCN with EBDPs and those without, when adjusted for child and family characteristics? and (3) To what extent is care coordination associated with rates of need and unmet need for CSHCN with and without EBDPs, adjusting for child and family characteristics?

METHODS

We performed a cross-sectional cohort study of a nationally representative sample of CSHCN, using logistic regression to assess unadjusted and adjusted rates of need and unmet need for supportive and home health services for CSHCN with and without EBDPs. We also assess the association of care coordination with rates of unmet need for each service for CSHCN with and without EBDPs.

Patient and public involvement

Patients and members of the public were not involved in the design or execution of this study.

Data sources

This study used the 2009–2010 National Survey of CSHCN—the most recent nationally representative data examining specialised paediatric health service needs and utilisation. Children who screened as CSHCN numbered 40 342 among the nearly 200 000 households with children sampled nationwide. The children’s caregivers completed interviews about the child’s health and health service use. Additional information about the development and administration of the survey is detailed elsewhere17 and data are publicly available.

Independent variables

We included all CSHCN in the analysis, comparing those with and without EBDPs. In addition, we compared adequate care coordination with those reporting ‘never/sometimes’ having enough assistance with arranging care. Online supplemental appendix A provides additional details about how EBDP and care coordination variables were constructed, and the values associated with each variable.

Dependent variables

The outcome variables include need and unmet need for five specialised health services: (1) OT, ST or PT, (2) home health, (3) durable medical equipment (DME), (4) mobility aids and (5) communication aids. All dependent variables in the study were obtained directly from a series of questions about the parents’ perception of need for these healthcare services and whether those needs were fully met (see online supplemental appendix A).

Control variables

Drawing on Gelberg et al’s Behavioural Model for Vulnerable Populations,18 we controlled our analysis for a variety of need, predisposing and enabling factors. Need included condition severity (condition affects the child’s ability to do things very little or sometimes, or usually). Predisposing characteristics included the child’s race/ethnicity (white only, black only, Hispanic black or white, and other), sex (male or female) and age (0–3 years, 4–12 years and 13–17 years). Enabling child characteristics included insurance type (private, public and public with private, other or uninsured), whether the child had a usual source of healthcare (none, or one or more), and whether they had been uninsured at any time in the prior 12 months. Enabling family covariates include the income level of the family (0%–199% Federal Poverty Line (FPL) or 200+% FPL), parent language (English or not), parent education level (less than high school, or high school or
more) and the number of adults in the household (less than two adults, or two or more adults).

Enabling environmental characteristics included whether a child lived in a non-urban or urban area. Due to data suppression in the publicly available data, this was not available for all children in the state set, so a proxy variable was created. Children living in a state with few metropolitan statistical areas (MSAs) were classified as non-urban, and those living in states with large numbers of MSAs were classified as urban.

Sample preparation

Total observations in the 2009/2010 NS-CSHCN are 40,242. If parents or guardians responded ‘don’t know’ or ‘refused to answer’ for control, diagnostic and specialised health service need and unmet need questions, we excluded these observations in models using these variables. Because less than 10% of the data is missing for any model, dropping these observations does not compromise the national representativeness of the data or analytic results.

Analysis

Descriptive analyses identified sample size and proportions of CSHCN by clinical, demographic, family, and healthcare need and unmet need characteristics. We also estimated proportions and sample sizes of CSHCN with and without EBDPs with need and unmet need for each specialised health service. Multivariable logistic regression assessed adjusted OR (AOR) for need and met need for each specialised health service, comparing CSHCN with and without EBDPs, and assessing the association of adequate care coordination with having needs met for both populations.

Fifteen fixed effects logistic regression models were fitted for the full sample. Five models assessed need for each of the specialised health services specified above, and five models assessed if needs were met for each type of specialised health service. To estimate the association between EBDP with need for each specialised health service, health service need models were fit to the full sample of CSHCN with EBDP as a covariate, controlling for need, predisposing and enabling factors. To estimate the association between EBDP and care coordination with needs for each specialised health service, health service need models were fit to the full sample of CSHCN with EBDP and EBDP with need for each specialised health service, comparing CSHCN with and without EBDPs, and assessing the association of adequate care coordination with having needs met for both populations.

RESULTS

Sample characteristics

Sample characteristics for predictors and covariates are presented in table 1, and table 2 reports nationally representative rates of need and unmet need for the full sample and stratified by EBDP status. Overall, nearly one-third (31.8%) of the sample qualified as having an EBDP. Nearly all parents (85.6%) reported usually having adequate care coordination. CSHCN had the greatest need for OT, ST or PT, with 27% of all caregivers reporting need. For home health services, rates of need were much lower in general (4%). Over 10% of CSHCN needed DME and only 4% of CSHCN needed mobility aids. Communication assistance was the least commonly reported need (2%), but the mostly likely to be unmet (25%). For all services, CSHCN with EBDPs had higher rates of need and unmet need, except for DME. CSHCN with no EBDP had higher rates of need for DME (13% vs 9%), but lower rates of unmet need (3% vs 8%).

Table 3 reports the adjusted rate of need and met need for specialised health services for CSHCN with EBDPs compared with those without. Predicted probabilities of need and having needs met for all services for both populations are presented in online supplemental appendix B. It also reports the association of having an EBDP with having needs for specialised services met, and the adjusted rate of having needs met for CSHCN with no EBDPs who have adequate care coordination. Predicted probabilities for having needs met for each service for CSHCN with and without EBDPs, and with and without adequate care coordination are presented in online supplemental appendix D. Having an EBDP was significantly and positively associated with need for OT, ST or PT (AOR=2.17 (95% CI 1.98 to 2.39)), home healthcare (AOR=2.00 (95% CI 1.65 to 2.45)), and communication aids (AOR=2.91 (95% CI 2.22 to 3.83)), and negatively associated with need for DME (AOR=0.57 (95% CI 0.49 to 0.66)). Having an EBDP was negatively associated with having needs met for OT, ST or PT (AOR=0.67 (95% CI 0.48 to 0.93)), home health (AOR=0.28 (95% CI 0.14 to 0.53)), and DME (AOR=0.51 (95% CI 0.32 to 0.82)). Adequate care coordination was significantly associated with increased rates of having needs met for OT, ST and PT (AOR=3.25 (95% CI 2.65 to 3.98)), home health (AOR=4.62 (95% CI 2.64 to 8.11)), DME (AOR=2.10 (95% CI 1.28 to 3.46)) and communication aids (AOR=7.62 (95% CI 2.96 to 19.58)).

Table 4 presents the association of adequate care coordination with having needs for each specialty health service met specifically for CSHCN with EBDPs. For CSHCN with EBDPs, adequate care coordination is associated with increased rates of having needs met for OT, ST
DISCUSSION

This study reports nationally representative rates of need and unmet need for specialised health services for CSHCN in the USA, distinguishing between those with and without EBDPs. This study also assessed the role of care coordination in having these needs met. In general, the needs of CSHCN for specialised health services are being met relatively well—with rates of unmet need across all types of services reported at or below 25%. However, significant differences exist in needs and rates of unmet need between CSHCN with and without EBDPs. Adjusted rates of need and having needs met for OT, ST, PT, home healthcare and communication aids were higher among CSHCN who reported EBDPs, compared with those who did not. Having adequate care coordination was associated with greater rates of having needs met for OT, ST, PT, home healthcare and communication aids among all CSHCN—with and without EBDPs.

These results are consistent with existing research—that children with more complex needs, EBDPs and functional impairments have a greater need and higher rates of unmet need for healthcare services.3 5 6 12 20 In addition,
the consistency of these findings with earlier studies5 20 suggests CSHCN’s needs are stable over time. Though there are no direct studies on the role of care coordination in accessing these specialised services nationwide, the findings here are consistent with other studies demonstrating the role of care coordination in accessing health, behavioural health and specialised healthcare.11 21

Positive indicators of health system functioning for CSHCN in the USA are low rates of unmet need for home healthcare, DME and mobility aids. However, the reported unmet need for OT, ST or PT is relatively high, with almost 20% of children and youth going without needed therapies. Access problems may be located in payer systems in the form of insurance limits (eg, session limits, annual or lifetime maximums) associated with these services, particularly in commercial health insurance plans.6 9 Insufficient reimbursement rates may also serve as a disincentive for provision of care and contribute to these workforce’s insufficiencies in numbers and geographical location.21 The workforce’s existing maldistribution may also place children at risk for disparities in accessing these services, particularly in rural areas.23 Further policy and research are needed to isolate the source of these unmet needs, as policies that ensure children with complex healthcare needs can access these services can improve health outcomes and quality of life.10

Though the need for communication aids is extremely low among CSHCN, the rate of unmet need for this service is high (25%). Because the inability to communicate can exacerbate behavioural or emotional problems in children,24 complicating and straining home life for families25 and potentially leading to placement in out-of-home care,26 unmet need for communication aids is particularly problematic. This study demonstrates that adequate care coordination is associated with greater probability of meeting this need—especially for children with EBDPs. Whether it is problems located in the payer source, location of services or simply availability of needed devices, further research is needed to uncover the source of service inadequacy.

The association of adequate care coordination with higher rates of having specialised health service needs met contributes to the growing evidence that this service is essential to reducing barriers to a wide range of healthcare services for CSCHN in the USA.11 21 27–30 Care coordination can help to integrate the fragmented healthcare

| Table 2 | Sample size and unweighted proportions of need and met need for specialised health services for CSHCN, stratified by EBDP status |
|---|---|---|---|---|---|---|---|---|
| Missing | No need | Need | Missing | Unmet Needs* | Need Met* |
| n | %† | n | %† | n | %† | n | %† |
| **Occupational, speech and physical therapy** | | | | | | | |
| No EBDPs | 16 | 22 497 | 80 | 5337 | 20 | 19 | 684 | 13 | 4634 | 87 |
| EBDPs | 19 | 7445 | 60 | 4928 | 40 | 21 | 1065 | 22 | 3841 | 78 |
| Total | 35 | 29 942 | 73 | 10 265 | 27 | 40 | 1749 | 18 | 8475 | 82 |
| **Home health** | | | | | | | |
| No EBDPs | 19 | 27 082 | 97 | 749 | 3 | 19 | 44 | 5 | 705 | 95 |
| EBDPs | 26 | 11 579 | 93 | 787 | 7 | 26 | 140 | 19 | 647 | 81 |
| Total | 45 | 38 661 | 96 | 1536 | 4 | 45 | 184 | 13 | 1352 | 87 |
| **Durable medical equipment** | | | | | | | |
| No EBDPs | 7 | 24 657 | 87 | 3186 | 13 | 0 | 105 | 3 | 3080 | 97 |
| EBDPs | 4 | 11 401 | 91 | 987 | 9 | 1 | 88 | 8 | 898 | 92 |
| Total | 11 | 36 058 | 89 | 4173 | 11 | 1 | 193 | 4 | 3978 | 96 |
| **Mobility aid** | | | | | | | |
| No EBDPs | 2 | 26 761 | 96 | 1079 | 4 | 1 | 56 | 6 | 1022 | 94 |
| EBDPs | 3 | 11 782 | 95 | 606 | 5 | 3 | 60 | 10 | 543 | 90 |
| Total | 5 | 38 543 | 96 | 1685 | 4 | 4 | 116 | 8 | 1565 | 92 |
| **Communication aids** | | | | | | | |
| No EBDPs | 9 | 27 497 | 99 | 336 | 1 | 1 | 66 | 19 | 269 | 81 |
| EBDPs | 20 | 11 718 | 95 | 653 | 5 | 3 | 173 | 27 | 477 | 73 |
| Total | 29 | 39 215 | 98 | 989 | 2 | 4 | 239 | 25 | 746 | 75 |

Data source: Centers for Disease Control and Prevention, National Centre for Health Statistics, National Survey of CSHCN, 2009–2010.

*Among CSHCN with reported need.
†Weighted proportion.

CSHCN, children with special healthcare needs; EBDPs, emotional, behavioural and developmental disorders.
in state and federal policy, including the Affordable Care Act. However, widespread adoption and implementation remain limited due to workforce, funding and logistical concerns. As a result, receipt of care coordination remains inconsistent for families who need it, and barriers to care coordination must be identified and addressed.

Because federal mandates require that Medicaid cover any services or supports needed to treat a child diagnosed with any condition, public insurance usually covers a wider array of critical services and supports than private insurance for CSHCN. Indeed, public insurance has been demonstrated to be associated with lower rates of unmet need for a variety of special healthcare services for CSHCN. Model outputs in online supplemental appendix D underscore this point, as public insurance is significantly associated with reduced rates of having needs met for the most highly specialised services—DME and communication aids. As such, gaining access to Medicaid coverage may enhance access and remove cost related barriers to many services.

HCBS Medicaid waivers may be a key policy mechanism for increasing access to coverage for critical supports for these children, as the majority of these programmes cover all of the specialty health services examined here, including care coordination. However, limits on waiver programme capacity may play some role in unmet needs for this population, as 1915(c) MCBS Medicaid waiver programmes cap enrolment and enrolment capacity vary significantly across states. Expanding the capacity of these programmes may play a critical role in meeting the needs of children with complex medical, developmental or behavioural healthcare needs. In addition, other home and community-based Medicaid programmes—such as

Table 3  Adjusted rates of need and having needs met for CSHCN: associations with EBDPs and care coordination

| Need for occupational, speech or physical therapy | OR (95% CI) |
|-------------------------------------------------|-------------|
| EBDP                                           | **2.17 (1.98 to 2.39)** |
| Need for occupational, speech or physical therapy met* | **EBDP** 0.67 (0.48 to 0.937) |
| Adequate care coordination                     | **3.25 (2.65 to 3.98)** |
| Need for home healthcare                       | **EBDP** 2.00 (1.63 to 2.45) |
| Need for home health met*                      | **EBDP** 0.28 (0.14 to 0.53) |
| Adequate care coordination                     | **4.62 (2.64 to 8.11)** |
| Need for durable medical equipment             | **EBDP** 0.57 (0.49 to 0.66) |
| Need for durable medical equipment met*         | **EBDP** 0.51 (0.32 to 0.82) |
| Adequate care coordination                     | **2.10 (1.28 to 3.46)** |
| Need for mobility aids                         | **EBDP** 0.95 (0.77 to 1.17) |
| Need for mobility aids met*                    | **EBDP** 0.56 (0.29 to 1.06) |
| Adequate care coordination                     | **1.62 (0.87 to 3.04)** |
| Need for communication aids                    | **EBDP** 2.91 (2.22 to 3.83) |
| Need for communication aids met*               | **EBDP** 0.65 (0.36 to 1.17) |
| Adequate care coordination                     | **2.62 (1.52 to 4.51)** |

Data source: Centers for Disease Control and Prevention, National Centre for Health Statistics, National Survey of CSHCN, 2009–2010. ORs adjusted for child’s age, race, sex, urban residence, functional severity, insurance type, lack of insurance in past 12 months, usual source of care, family income, adults in household, parent language and education. Reference groups are CSHCN with no EBDPs and inadequate care coordination. Values in bold italics are significant at p<0.05.
*Among CSHCN with reported need.
CSHCN, children with special healthcare needs; EBDPs, emotional, behavioural and developmental disorders.

Table 4  Association of care coordination with rates of having specialty healthcare needs met among CSHCN with EBDPs

| Need for occupational, speech or physical therapy | AOR (95% CI) |
|-------------------------------------------------|-------------|
| Occupational, speech or physical therapy        | **3.23 (2.49 to 4.20)** |
| Home healthcare                                 | **5.59 (2.82 to 11.09)** |
| Durable medical equipment                       | 1.81 (0.90 to 3.66) |
| Mobility aids                                   | 1.55 (0.62 to 3.84) |
| Communication aids                              | **1.83 (1.03 to 3.26)** |

Data source: Centers for Disease Control and Prevention, National Centre for Health Statistics, National Survey of CSHCN, 2009–2010. ORs adjusted for child’s age, race, sex, urban residence, functional severity, insurance type, lack of insurance in past 12 months, usual source of care, family income, adults in household, parent language and education. Reference groups are CSHCN with no EBDPs and inadequate care coordination. Values in bold italics are significant at p<0.05.
*Among CSHCN with reported need.
CSHCN, children with special healthcare needs; EBDPs, emotional, behavioural and developmental disorders.

experienced by families when their CSHCN receives care and supports from a wide range of providers and service sectors (eg, schools, outpatient providers, inpatient care and behavioural healthcare) which often poses barriers to care access or engagement. It accomplishes this through activities and communication across and between providers or services systems (eg, primary care, specialty providers, hospital admissions, home and community-based care providers) aimed at keeping all providers working collaboratively and cooperatively towards the same healthcare goals for a given child.

Care coordination has emerged over the last decade as a solution to the fragmented care experienced by families of CSHCN and has been promoted through incentives...
the Katie Beckett option which allows children needing an institutional level of care to qualify for Medicaid regardless of family income levels and for which states are not allowed to cap enrolment—may be a viable alternative for reducing unmet need.42

Strengths and limitations
This study has several limitations. First, this study used caregiver reported data. The caregiver may have different perceptions of need or unmet need for specialised healthcare services than clinicians who care for a child.46 They may also incorrectly recall use of services in the past year. However, studies comparing survey participants’ reported service use to utilisation data demonstrate no significant differences.47 Second, study data collection occurred in 2009–2010. Despite the gap in time, this is the most recent national data about CSHCN’s need for and use of highly specialised healthcare services in the United States. The consistency between our findings and those from studies examining CSHCN’s need and unmet need for specialised healthcare services in 20015 and 2005 suggests that needs have not changed significantly, and that rates of unmet need persist over time. Third, while the data include a large, national sample of CSHCN, some needs and unmet needs for specialised healthcare services represented rare events. As such, there is the possibility of small sample bias of maximum likelihood estimation.48 In addition, as the data are survey weighed to be nationally representative with finite population parameters, we cannot reduce the effect of the small sample bias using the Firth method.49

CONCLUSION
CSHNC are a heterogeneous population with unique needs for specialised health services. We identified the rate of specialised health service needs and unmet needs and compared them among subpopulations of CSHCN. Medicaid waiver and other home and community-based services programmes in the USA, which are tailored to meet specialised health service needs of children with complex healthcare needs, may contribute to low or moderate rates of unmet needs. Care coordination, which is provided through these programmes,50 may be playing a critical role in helping to meet these specialised needs. Future exploration of the role of care coordination in ensuring families can access other types of healthcare services—such as mental healthcare—will further clarify the importance of care coordination in access to care for CSHCN.

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# Appendix A. Variable Definitions

| Variable | Question | Variable Values |
|----------|----------|-----------------|
| Emotional, Behavioral, or Developmental Problem (EBDP) | • “Does (this) child have any kind of emotional, developmental or behavioral problem for which he/she needs treatment or counseling?”  
• “Has [his/her]’s emotional, developmental, or behavioral problem lasted or expected to last for 12 months or longer?” | Yes and Yes = 1 |
| Adequate Care Coordination | “During the past 12 months, have you felt that you could have used extra help arranging or coordinating [your child]’s care among these different health care providers or services?” & “How often did you get as much help as you wanted with arranging or coordinating [your child]’s care?” | • Yes & Never/Sometimes = 0, Not Adequate Care Coordination  
• Yes & Usually = 1, Adequate Care Coordination |
| Health Service Need | “During the past 12 months, was there any time when [child] needed [specialized health service]?” (Y=1/N=0) | • No = 0, No Need  
• Yes = 1, Need |
| Unmet Special Health Service Need | [Question asked after “Y” to previous question on perceived need for specialized health service] “Did [child] receive all the [specialized health service] that (he/she) needed?” (Y=1/N=0) | • No = 0, Needs not Met  
• Yes = 1, Needs Met |
### Appendix B. Predicted Probabilities for Need and Met Need for Specialty Health Services among CSHCN with and without EBDPs

| Service                          | CSHCN with no EBDPs | CSHCN with EBDPs |
|---------------------------------|---------------------|------------------|
|                                 | Margin 95% CI       | Margin 95% CI    |
| **Occupational, Speech or Physical Therapy** |                     |                  |
| Need                            | 0.22 0.21 0.23      | 0.36 0.34 0.37   |
| Need Met                        | 0.87 0.85 0.88      | 0.82 0.80 0.84   |
| **Home Health Care**            |                     |                  |
| Need                            | 0.03 0.03 0.04      | 0.06 0.05 0.07   |
| Need Met                        | 0.95 0.92 0.98      | 0.87 0.82 0.91   |
| **Durable Medical Equipment**   |                     |                  |
| Need                            | 0.13 0.12 0.14      | 0.08 0.07 0.09   |
| Need Met                        | 0.96 0.95 0.98      | 0.94 0.91 0.96   |
| **Mobility Aids**               |                     |                  |
| Need                            | 0.04 0.04 0.05      | 0.04 0.04 0.05   |
| Need Met                        | 0.95 0.94 0.97      | 0.92 0.88 0.96   |
| **Communication Aids**          |                     |                  |
| Need                            | 0.01 0.01 0.02      | 0.04 0.03 0.04   |
| Need Met                        | 0.82 0.71 0.93      | 0.71 0.55 0.86   |

*Data Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Survey of Children with Special Health Care Needs, 2009–2010.*

**Adjusted for child's age, race, sex, urban residence, functional severity, insurance type, lack of insurance in past 12 months, usual source of care, family income, adults in household, parent language and education

* Among CSHCN with reported need
Appendix C. Predicted Probabilities for Having Needs for Specialty Health Services Met among CSHCN with and without EBDPs and Adequate Care Coordination

| Service                          | CSHCN with no EBDPs |                      |                      | CSHCN with EBDPs |                      |                      |
|---------------------------------|----------------------|----------------------|----------------------|------------------|----------------------|----------------------|
|                                 | Margin 95% CI        | Margin 95% CI        | Margin 95% CI        | Margin 95% CI    | Margin 95% CI        | Margin 95% CI        |
| Occupational, Speech or Physical Therapy | 0.72 0.67 0.78 | 0.89 0.88 0.91 | 0.64 0.59 0.69 | 0.85 0.83 0.87 |                      |                      |
| Home Health Care                 | 0.89 0.82 0.97 | 0.96 0.93 0.99 | 0.68 0.55 0.80 | 0.90 0.86 0.95 |                      |                      |
| Durable Medical Equipment       | 0.94 0.91 0.97 | 0.97 0.96 0.98 | 0.89 0.84 0.94 | 0.94 0.92 0.97 |                      |                      |
| Mobility Aids                   | 0.92 0.87 0.97 | 0.96 0.94 0.98 | 0.90 0.83 0.97 | 0.92 0.88 0.97 |                      |                      |
| Communication Aids              | 0.53 0.34 0.72 | 0.86 0.75 0.97 | 0.60 0.44 0.76 | 0.72 0.57 0.88 |                      |                      |

*Data Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Survey of Children with Special Health Care Needs, 2009–2010.
**Adjusted for child's age, race, sex, urban residence, functional severity, insurance type, lack of insurance in past 12 months, usual source of care, family income, adults in household, parent language and education

* Among CSHCN with reported need
### Appendix D. Adjusted Rates of Unmet Need for CSHCN: Associations with EBDPs and Care Coordination (Full Models)

|                  | Occupational, Speech, and Physical Therapy | Home Health | Durable Medical Equipment | Mobility Aid | Communication Aids |
|------------------|---------------------------------------------|-------------|---------------------------|--------------|-------------------|
|                  | OR  p     95% CI                             | OR  p     95% CI | OR  p     95% CI         | OR  p     95% CI | OR  p     95% CI   |
| EBDP             | 0.67 0.00 0.55 0.82                        | 0.28 0.00 0.14 0.53 | 0.51 0.01 0.32 0.82 | 0.56 0.08 0.29 1.06 | 0.65 0.15 0.36 1.17 |
| Adequate Care Coordination | 3.25 0.00 2.65 3.98 | 4.62 0.00 2.64 8.11 | 2.10 0.00 1.28 3.46 | 1.62 0.13 0.87 3.04 | 2.62 0.00 1.52 4.51 |
| Severe Impairments   | 0.67 0.01 0.49 0.91                        | 0.45 0.33 0.09 2.24 | 1.80 0.12 0.87 3.73 | 0.35 0.18 0.07 1.65 | 2.81 0.27 0.44 17.85 |
| **Race**          |                                             |             |                           |              |                   |
| Black Only        | 0.79 0.11 0.59 1.06                        | 2.50 0.05 1.00 6.28 | 1.57 0.23 0.75 3.31 | 0.54 0.19 0.21 1.37 | 0.85 0.71 0.37 1.95 |
| Hispanic (Black or White) | 1.00 0.99 0.73 1.38 | 1.71 0.15 0.83 3.53 | 1.05 0.89 0.53 2.09 | 0.65 0.36 0.26 1.63 | 0.82 0.64 0.35 1.90 |
| Other             | 0.81 0.25 0.57 1.15                        | 0.90 0.85 0.29 2.76 | 0.97 0.93 0.45 2.07 | 0.98 0.97 0.33 2.92 | 1.08 0.88 0.41 2.80 |
| **Age Group**    |                                             |             |                           |              |                   |
| 4 through 12 years | 0.97 0.84 0.69 1.35                        | 0.34 0.02 0.13 0.85 | 0.34 0.00 0.16 0.68 | 0.38 0.19 0.09 1.63 | 0.09 0.00 0.02 0.37 |
| 13 through 17 years | 0.91 0.61 0.63 1.32 | 0.30 0.02 0.11 0.81 | 0.42 0.03 0.19 0.93 | 0.46 0.30 0.11 1.98 | 0.12 0.00 0.03 0.49 |
| **Sex**          |                                             |             |                           |              |                   |
| Female            | 0.93 0.49 0.75 1.14                        | 1.26 0.45 0.69 2.31 | 0.55 0.01 0.35 0.89 | 0.93 0.84 0.47 1.86 | 0.92 0.77 0.55 1.55 |
| **Insurance Type** |                                             |             |                           |              |                   |
| Public            | 1.20 0.24 0.88 1.64                        | 0.88 0.79 0.35 2.21 | 0.39 0.00 0.20 0.74 | 0.95 0.92 0.36 2.47 | 0.52 0.04 0.28 0.96 |
| Dual              | 1.32 0.10 0.95 1.84                        | 1.17 0.72 0.49 2.77 | 0.38 0.01 0.18 0.80 | 0.76 0.61 0.27 2.15 | 1.13 0.73 0.56 2.28 |
| Other             | 0.86 0.57 0.51 1.44                        | 0.18 0.06 0.03 1.04 | 0.52 0.41 0.11 2.52 | 0.25 0.09 0.05 1.21 | 0.68 0.59 0.17 2.72 |
| Uninsured         | 0.72 0.31 0.38 1.36                        | 1.44 0.65 0.30 6.98 | 0.33 0.03 0.13 0.88 | 2.45 0.36 0.37 16.32 | 0.59 0.53 0.11 3.04 |
| Usual Source of Care | 1.24 0.26 0.85 1.79 | 1.85 0.19 0.75 4.57 | 1.65 0.23 0.73 3.74 | 0.48 0.27 0.13 1.78 | 1.33 0.60 0.46 3.86 |
| Uninsured in the Last 12 Months | 0.58 0.01 0.38 0.89 | 0.28 0.01 0.11 0.73 | 0.38 0.01 0.19 0.76 | 0.38 0.04 0.14 0.97 | 0.44 0.12 0.15 1.25 |
| 200% FPL or above | 0.84 0.24 0.64 1.12                        | 0.83 0.64 0.37 1.83 | 1.68 0.09 0.92 3.05 | 0.90 0.79 0.43 1.90 | 1.25 0.41 0.74 2.14 |
| More than High School | 0.88 0.37 0.67 1.16 | 0.94 0.85 0.48 1.83 | 0.71 0.30 0.37 1.35 | 0.95 0.90 0.45 2.02 | 0.53 0.06 0.27 1.03 |
| Two or More Adults | 1.12 0.38 0.86 1.46 | 0.59 0.12 0.30 1.14 | 1.10 0.73 0.64 1.91 | 0.77 0.54 0.34 1.76 | 0.91 0.78 0.47 1.76 |
| English is not Household Language | 0.85 0.64 0.43 1.70 | 3.60 0.17 0.58 22.37 | 2.86 0.11 0.80 10.30 | 0.78 0.76 0.16 3.83 | 35.47 0.00 5.61 224.27 |
| Urban State Residence | 0.92 0.51 0.73 1.17 | 0.77 0.46 0.39 1.53 | 0.89 0.72 0.49 1.63 | 0.94 0.87 0.45 1.96 | 1.02 0.94 0.55 1.90 |

*Data Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Survey of Children with Special Health Care Needs, 2009–2010.

**Reference group is: no reported EBDPs, inadequate care coordination, mild or moderate impairment, white, 0-5 years of age, male, private insurance, no source of usual care, less than 200% FPL, less than two adults in the household, English is household language, and rural state residence.*