Model Demonstration Coordination Center

Early Childhood Language Interventions: An Illustration of the Model Demonstration Process

Project Findings in Brief

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Abbreviations and Acronyms

C3	cohort 3
ECI-IGDI	Early Communication Indicators of Individual Growth and Development for Infants and Toddlers
EI	early intervention
EITA	Early Intervention Technical Assistance
EMT	enhanced-milieu teaching
FGRBI	family-guided routines-based intervention
FSU	Florida State University
IDEA	Individuals with Disabilities Education Act
IEP	individualized education program
IFSP	individualized family services plan
KTTP	KidTalk Tactics Project
MDCC	Model Demonstration Coordination Center
MDP	model demonstration project (OSEP grantees)
NIRN	National Implementation Research Network
OSEP	Office of Special Education Programs
PALS	Participatory Adult Learning Strategy
PD	professional development
PI	principal investigator
PLS-4	Preschool Language Scale, Fourth Edition
VU	Vanderbilt University

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Project Findings in Brief

In administering the Individuals with Disabilities Education Act (IDEA), the U.S. Department of Education's Office of Special Education Programs (OSEP) pursues a mission of "improving results for infants, toddlers, children and youth with disabilities ages birth through 21, by providing leadership and financial support to assist states and local districts" (U.S. Department of Education, 2007, p. 13485). An important part of that pursuit is the Research to Practice Division's technical assistance, model demonstration, and dissemination activities. This project brief summarizes the characteristics, implementation experiences, and outcomes achieved by one of OSEP's investments in model demonstration activities—a cohort of three grantees that demonstrated various approaches to implementing early childhood language interventions that targeted children with significant language disorders or delays and who were eligible for early intervention services.

Current Model Demonstration Activities

Since 1970, Congress has authorized OSEP to conduct model demonstrations to improve early intervention, educational, and transitional results for children with disabilities [Sec. 661 (a)]. The purpose of model demonstration projects (MDPs) is to develop new practice, procedure, or program models on the basis of theory and/or evidence-based research. Each MDP then implements its model in typical settings, assesses impacts, and, if the model is associated with benefits, may go on to disseminate or scale-up the model. Since 2005, OSEP has funded seven cohorts of MDPs, each focused on a single new and promising (or perhaps poorly understood or implemented) practice, procedure, or program that is deemed to have high potential for improving child outcomes.

Recognizing the importance of improving the language and communication abilities of young children, OSEP requested applications to evaluate models that incorporated evidence-based early childhood language interventions within the early intervention (EI) and early childhood special education service systems (IDEA Parts C and B). Grants were awarded to (1) the Orelena Hawks Puckett Institute, which worked in three states, partnering with local Part C providers and programs providing EI services; (2) the University of Kansas, which partnered with three programs delivering Part C services in Kansas; and (3) Vanderbilt University (VU) and Florida State University (FSU), each of which worked with two programs (VU with two preschools in Tennessee and FSU with a regional program providing EI services and with a local Early Head Start program, both in Florida). The MDPs began their model demonstration work in January 2008 and began implementing the models within 6 months, introducing them to partners, providing professional development (PD) on the model interventions, and recruiting families and providers. Implementation continued for 4 years, through December 30, 2011.[1] At that time, OSEP approved a request by the MDPs to continue to follow participating children and families to collect follow-up data on children's outcomes and transitions from Part C services and into kindergarten.

[1] Kansas continued to implement the intervention through spring 2013 for a subset of children who were still receiving Part C services and the MDP intervention.

The early childhood language intervention MDPs were the third cohort of grantees facilitated by OSEP's Model Demonstration Coordination Center (MDCC) at SRI International. SRI was awarded contracts in 2005 and 2010 to collect consistent data across MDPs in each cohort and across cohorts over multiple years and topic areas. MDCC has worked with cohort 3 (C3) and other cohorts to establish consistent design elements, such as sample definition and selection, data collection methods and timing, and instrumentation, and to synthesize cross-MDP data. Consistent data collection within a given cohort enables comparison of the relative ease with which models were implemented with fidelity in participating programs and supports comparison of the relative outcomes achieved when the unique approach of each model was implemented. The findings regarding C3's implementation experiences and their child and system-level outcomes, where available, have been synthesized by MDCC staff and are summarized here.

Focusing MDCC Activities, Analyses, and Products

A set of evaluation questions and a conceptual framework for addressing them have focused and organized MDCC's work.

Evaluation Questions

MDCC developed a three-level series of evaluation questions. Level 1 questions are specific to each MDP within a cohort and were suggested to the MDPs as a focus of their individual evaluations of their own projects. Level 2 questions pertain to the process of developing and implementing models across the MDPs within a cohort and are addressed here. Level 3 questions are being addressed by the MDCC across the MDPs in all the cohorts (Wagner et al., 2010). Table 1 presents the level 2 cross-MDP questions for C3. Not all findings related to these questions are reported in this brief, which summarizes key findings as they relate to the conceptual model of the model demonstration guiding MDCC's work.

A Conceptual Model of the Model Demonstration Process

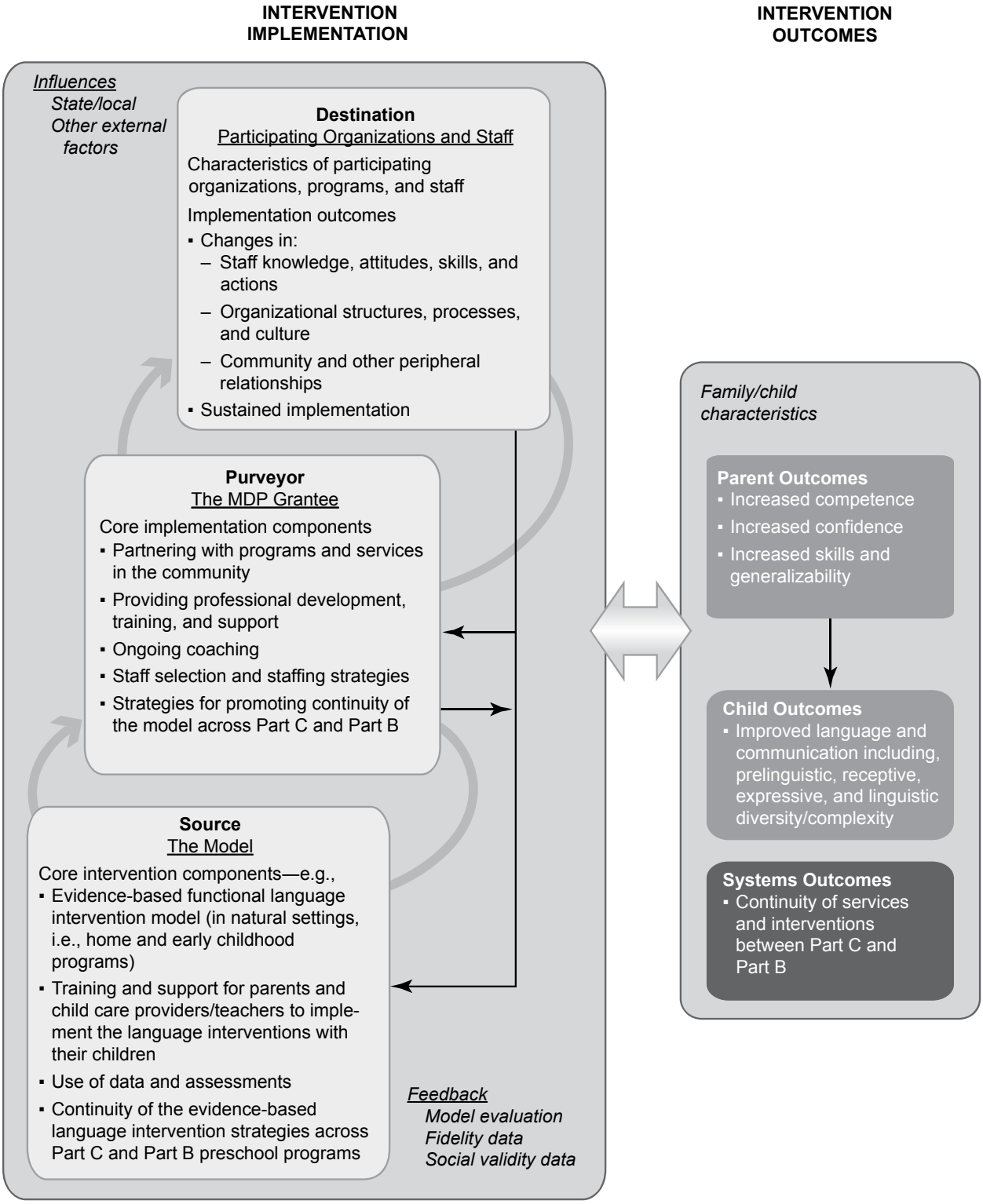
MDCC has adopted a conceptual model from the National Implementation Research Network (NIRN) that has four major elements (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005, Figure 1). ***Source*** is the model being implemented, which has ***core intervention components***. These refer to "the most essential and indispensable components of an intervention practice or program" (Fixsen et al., 2005, p. 24). The ***purveyor*** of the model is the MDP grantee, whose model has ***core implementation components*** for putting a model into practice. These include strategies for practitioner selection, providing PD, and training; offering ongoing coaching and support; and in the context of the C3 MDPs, promoting the continuity of the model intervention strategies across Part C and Part B programs. The framework posits that these actions of the MDPs are the mechanisms through which the models are transmitted to participating early intervention and preschool programs—the ***destination***—and the providers in them, who are the intended implementers of the model with parents. A fourth element involves the model development context, or the ***influences*** on the implementation process, such as general economic conditions or state or local policies.

The conceptual model also posits three ***implementation outcomes*** that would be expected within the destination organization if implementation is successful: (1) changes in the knowledge

Table 1. Level 2 Evaluation Questions for Early Childhood Language Intervention Models

Model Development
1a. How do the core intervention components of early childhood language intervention models differ? 1b. How do differences in intervention components relate to the models' perceived: • Relative advantage • Complexity • Compatibility with the destination organization and contextual environment • Social validity? 1c. How do differences in perceptions of the models' relative advantage, complexity, compatibility, and social validity relate to the fullness/fidelity of model implementation and to establishing conditions supportive of sustainability?
Implementation
2a. How do early childhood language intervention models differ with regard to: • Strategies for partnering with programs and services (providers) in the community • Professional development approaches • Approaches to ongoing support • Staffing strategies • Ways of learning from implementation experiences and adapting core implementation and intervention components? 2b. How do differences in core implementation components relate to the fullness/fidelity of model implementation, social validity, and establishing conditions supportive of sustainability?
3a. How do destination organizations differ with regard to implementation outcomes—their ability to establish the following in support of implementation with fidelity and the potential for sustainability: • Provider knowledge, attitudes, and actions/behavior • Organizational structures, processes, and culture • External relationships?
4a. How do model contexts differ with regard to: • Early intervention programs, providers, and agency support for/alignment with model • Early intervention program resources provided for model implementation/sustainability • Other circumstances/authorities outside the model that exert some control over implementation and/or sustainability (e.g., Part C program eligibility variation)? 4b. How do differences in model contexts relate to the fullness/fidelity of model implementation, social validity, and establishing conditions supportive of sustainability?
Intervention Outcomes
5a. How do models, programs, and providers differ with regard to: • Parent-level outcomes • Child care provider-/teacher-level outcomes (if applicable) • Child-level outcomes • System-level outcomes? 5b. How do differences in core intervention and implementation components, destination organizations, and influences relate to differences in individual- and system-level outcomes?

Figure 1. Conceptual Framework for Cohort 3 Model Demonstration Implementation and Outcomes



Note: Adapted from *Implementation Research: A Synthesis of the Literature* (Fixsen et al., 2005).

and skills of practitioners and other key staff members; (2) changes in organizational structures and cultures to bring about and support the changes in practitioner behavior; and (3) changes in relationships with consumers, stakeholders, and systems partners. A fourth implementation outcome critical in the model demonstration context is the sustainability of the model after the MDP ends. Because the NIRN conceptual model focuses solely on the implementation, not the results, of interventions, an element related to intervention outcomes needed to be added to reflect the full intention of the MDPs. The proximal outcome of the C3 models is to change parents' and other adults' behavior in specific ways that evidence suggests will improve children's language development. This improved language development is the distal or ultimate outcome sought by the MDPs. Systems outcomes involving an improved transition process from Part C to Part B programs also may occur. Finally, the conceptual model includes feedback loops—the learning paths through which implementation experience informs iterations in core intervention and implementation components.

The relationships between these conceptual framework components and implementation and intervention outcomes are the focus of this brief. It describes the three C3 models and the characteristics of the programs, providers, parents, and children with which they worked. It then summarizes their model implementation, from their preparations for model implementation through full implementation of their programs with providers who worked with parents. It also summarizes the child outcomes achieved. Drawing on research literature, hypotheses regarding how the dimensions of variations among the MDPs may relate to variations in implementation and intervention outcomes are offered. The MDPs' experiences and outcomes are then described and used to assess the extent to which the data presented support or refute the hypotheses considered. Lessons learned from the C3 MDPs conclude the brief.

Much of the data reported here are descriptive and qualitative and come from the templates and profile tools that were used by the MDP teams to document the features and design elements of their models, record the "story" of their model implementation processes, and describe the contexts within which they implemented their models. MDCC staff collaborated with the MDP teams to develop surveys, which augmented the information gathered in the profile tools, as did information from grantees' proposals and conference call notes. Quantitative data on implementation fidelity and child outcomes also were analyzed and are summarized here.

Core MDP Intervention Components

For OSEP-funded early childhood language intervention MDPs, the *source* element of the conceptual model that guided the MDCC's analyses was the model itself. The following sections that describe each MDP begin by describing the core intervention components of the models, as implemented in January 2008, including:

- Evidence-based functional language interventions delivered in natural settings (i.e., home and early childhood programs) by adults who cared for the child, such as parents and child care providers, or worked directly with the child, such as early childhood special education providers. The child caregivers were supported by specialists such as Part C service providers (e.g., speech-language pathologists).
- Training and support for parents and child care providers/teachers in implementing the language interventions.

- Use of assessments and data.
- Efforts to establish continuity of the evidence-based language intervention strategies across both Part C and Part B preschool programs.

All MDPs incorporated these components in their efforts to improve children's language development by teaching functional, naturalistic intervention strategies to parents, who then were to implement the strategies at home with their children. However, each MDP had somewhat different approaches to these components and placed greater emphasis on some than others, as described below.

The MDPs and Their Implementation Experiences

The MDPs began work in January 2008 with models, programs, staff, and participating children and families that differed in many ways, as described in the following sections for each MDP. After several months of planning and preparation, recruitment began in fall 2008 and increased steadily throughout 2009 and 2010. Implementation with service providers and, in some cases early childhood teachers, also began in 2008 and continued through 2011 for Puckett and VU/FSU, and through spring 2013 for Kansas. Implementation was an ongoing, iterative process whereby MDP staff repeatedly implemented, learned, and revised as they worked with providers and teachers. Each MDP's implementation "story," summarized below, begins with model initiation and follows with activities related to preparation (i.e., introducing the model and providing PD and coaching) and initial (i.e., first year) recruitment and start-up efforts. Full implementation involved delivering the evidence-based functional language interventions and providing the PD and coaching support needed to do so with fidelity. The implementation challenges MDPs reported encountering in their projects also are described.

Puckett

Model Characteristics

Puckett's model used everyday interest-based learning opportunities to promote the communication and language skills of children with language delays and difficulties. The model was based on the premise that using child interests and everyday family and community activities to support and promote children's learning would result in long-term positive outcomes for the child and family. The goal of the model was to increase the number and variety of interest-based learning opportunities provided for young children with disabilities (Dunst & Bruder, 2000; Dunst, Bruder, Trivette, Raab, & McLean, 1998). The model included methods for identifying interest-based everyday activities that were best suited for learning communication and language skills, procedures for increasing child participation in interest-based everyday activities, and instructional practices for supporting and strengthening child communication and language competence in the contexts of activities. The Puckett model had MDP staff train Part C providers in how to implement the model with parents and other caregivers in the child's home. The trained Part C providers then helped parents learn to implement the language-promoting strategies using the same procedures they had been taught.

Model Programs and Providers

Puckett staff members wanted to choose Part C programs for MDP implementation that had different modes of service delivery, were interested in using the model, and were open to viewing parents as important partners in supporting their children's learning. Puckett partnered with four programs (P1, P2, P3, and P4) in three states (Tennessee, Delaware, and North Carolina). The programs not only were the most geographically diverse among the MDPs, but also were the most varied in their service delivery systems/structures. Puckett worked with both Part C and general early childhood programs, which used a combination of direct employment and contracting of staff to provide EI services in a wide variety of settings. The extent of Puckett's prior experience with the selected programs varied widely across them. Puckett's programs had mostly bachelor's- and master's-level providers, with most of the providers specializing in either early childhood special education or speech-language pathology.

Participating Children and Families

The large majority of primary caregivers in three of the Puckett programs were White, whereas P2 served a largely Hispanic population. The Puckett programs appeared to have been serving more challenging households than other MDPs with regard to household employment and poverty. A majority of primary caregivers in all sites were either unemployed or working part time. The percentage of children who lived in a low-income household ranged from 48% to 76%, with an average of 62% across the Puckett programs. Less than half of children participating in Puckett's MDP programs were eligible for EI services because of a diagnosed condition; most were eligible because of a developmental delay. A majority of children in Puckett programs scored below average on all four domains of the developmental assessment conducted by MDP staff. Tallying up the presence of four socioeconomic risk factors (low caregiver education, low-income household, teen parent at child's birth, unemployed household), three biological/medical risk factors (birth complications, low birth weight, major surgeries of ear tubes); and three developmental functioning factors at baseline (below average Early Learning Composite scores, expressive language, receptive language), Puckett families had an average of 3.4 of these risk factors, with the highest number being present among families served by P1 and the lowest among families served by P4.

Implementation Stages

Initiation. MDP staff introduced the model to staff of potential programs, and Puckett staff reported good to excellent buy-in from program leadership. Program directors then introduced the MDP to the providers and invited MDP staff to attend a meeting to describe the project in more detail.

Preparation. The first three programs began model-related PD activities in September 2008, and P4 began implementation in year 2. The Participatory Adult Learning Strategy (PALS) was the foundation for both the initial PD and the ongoing consultation and coaching provided to providers. It entailed a six-step process that began with introducing information about a practice and illustrating it by example, then moved to providing opportunities to use the practice and examining what was done and what happened as a result, and concluded with having the learner reflect on his/her understanding of and ability to use the practice and determining other opportunities that would promote the learner's understanding and

use of it. The Puckett team modified the training format (e.g., one-to-one vs. small-group training) in recognition of the differences in resources, staffing patterns, and training needs in the programs. A PowerPoint presentation, training video, video clips illustrating the model components, practice checklists, and practice guides were used in training MDP coaches, who then trained providers. The providers used the same strategies and materials in training parents to implement the model practices. MDP coaches initially met with providers weekly or biweekly to review training procedures, troubleshoot, and share information, then shifted to a monthly schedule as providers gained mastery of the model strategies. In response to providers' early feedback on PD, MDP staff developed a matrix that coaches used to guide their use of PALS with providers and identify ways to improve the training process. In all, the MDP trained 21 providers.

Initial implementation. After the initial provider training, the PALS training approach was refined to ensure that all model components were covered, and recruitment of children and their families began. Although the MDP team planned to recruit 120 to 150 children and their families (40 to 50 at each site) by the end of the first year, Puckett had recruited approximately 30 to 40 children by then. This led MDP staff to decide to recruit directly for the project rather than wait for providers to recruit children and families from their caseloads. During the second year, an MDP staff member began to contact families directly to explain what participation in the project would entail and encourage participation. In addition, the MDP recruited another program in year 2, P4, to boost recruitment efforts. A total of 80 children and their families had been recruited by the end of project implementation.

Full implementation. Providers conducted weekly home visits with each family throughout their participation period, which generally ranged from 6 to 32 months. Ongoing coaching and weekly meetings between coaches and providers enabled providers to bring ideas and questions about implementing the language promotion strategies to the attention of the coaches, and coaches to evaluate the providers' understanding and use of the model practices with parents. Data collected on early parent implementation also were used to monitor how well providers taught the language intervention strategies to parents. The coaches' ongoing use of practice checklists was reported to help providers implement the practices with fidelity. They were used to introduce practices to providers, help them examine their practices against the standard, and reflect on their understanding and mastery of the practices. Data collected as the implementation progressed were said to be helpful in determining whether additional PD was needed. Late in the first implementation year, the MDP team sponsored two 45-minute webinars for providers that were intended to be "booster training" to reinforce the model process and strategies.

Implementation fidelity. Early MDP analysis of the provider fidelity data collected by MDP staff showed that fidelity in using the model strategies began at levels ranging from 30% to 70% across the various model strategies in the first 5 months and achieved rates of 70% to 100% over time. Puckett staff attributed these increases to bimonthly training sessions and ongoing practice. P1 had higher average provider fidelity scores than the other three programs, whereas P3's average provider fidelity scores were the lowest. Puckett staff concluded that providers could successfully teach parents to implement model components with fidelity in a relatively short time.

Three aspects of parent fidelity were measured biweekly through parent self-report: frequency of strategy use, the number of activities in which they were using strategies, and child

engagement. Parent fidelity data collected over a 12-week period ranged from 35% to 75% at the outset and increased to 80% to 100% over time. Overall, Puckett staff reported that 87% of parents implemented model strategies with fidelity. P3 parents had lower average child engagement fidelity scores and implemented the strategies somewhat less frequently than parents in the other programs.

Implementation Challenges

Puckett staff reported experiencing implementation challenges related to programs and providers and contextual factors.

Programs and providers. Participating in the MDP was said to require providers to change their view of their role from working primarily with children to working primarily with parents to support their children's learning. Recognizing this, MDP staff increasingly focused on helping providers to shift their emphasis to supporting parents and building parents' capacity to promote their children's language development. Also, although MDP staff had always intended to provide ongoing support for providers, the amount of support needed was more than anticipated. Provider turnover also was reported to be a challenge throughout implementation, and there were challenging aspects to supporting providers' work with parents. For example, some providers were more likely to make recommendations to parents about changes in their behavior with children rather than building parents' capacity to make those decisions themselves. As part of providers' ongoing PD, MDP staff increasingly emphasized the importance of promoting parent evaluation and decisionmaking about interest-based everyday activities and developed PALS tip sheets to help providers use PALS in their work with parents on each model component.

External context and system. Significant challenges also were reported to be inherent in implementing a home- and parent-based intervention within the Part C and Part B systems. Attrition of families occurred when the families of some children began attending child care programs and received EI services there, making home visits unworkable, and some families had to withdraw from the project because of family circumstances (e.g., military service members being transferred to other locations). In response to the challenges of recruitment and attrition of both children and providers, the project began working with a fourth program in year 2 to increase enrollment of children and families and identify a more engaged set of providers. Challenges that arose from factors that were beyond the control of the MDP included winter weather preventing providers from making home visits and changes in the state's Part C eligibility policies due to the state's financial crisis. Distance also hindered implementation by making it difficult to give providers ongoing PD and coaching, leading the MDP team to turn to webinars, e-mail contact, and individual phone contacts in supporting providers. Additionally, irreconcilable issues involving P2's contracted providers not being reimbursed for travel to home visits led MDP staff to end their work with the program at the end of year 3; they were not able to follow the children from this program. Finally, the structure of the Part C system itself was reported to hinder model implementation in that its emphasis was inconsistent with the abilities-based and interest-based approach of the model.

Promoting continuity across Part C and B systems. Puckett's MDP staff intended that as children transitioned from Part C to Part B services, some Part C providers and parents would communicate with Part B providers about the MDP strategies and encourage their consistent use

among children receiving Part B services. Part B program personnel were not directly contacted by MDP staff to encourage continuity of interventions, nor were materials or PD planned for Part B service providers. However, if families wanted to continue working with the MDP, a staff member made monthly contact with them to support them in continuing to use model strategies. In P2, a few parents reportedly asked permission for the Part C provider to attend the transition meeting where both the parent and Part C provider encouraged Part B providers to engage in a discussion of the child's interests, interest-based activities, and responsive teaching. However, Part B service providers were said to have used the information rarely if ever in planning the individualized education program (IEP) objectives and intervention strategies. For P1 and P3, most of the Part C providers were reported to have had little or no participation in the child's transition to Part B services.

Kansas

Model Characteristics

The Kansas MDP's model was a combination of eight functional naturalistic strategies to promote communication and language development. The strategies were derived from responsive intervention prelinguistic and milieu teaching, dialogic reading, and shared book reading, all of which are supported by an extensive research base. The model intervention strategies included, but were not limited to, following a child's lead, commenting and labeling, and other strategies to prompt communication and the use of these strategies across play, care routines, and early literacy activities within the context of the natural environment. Additionally, recent research conducted by the University of Kansas principal investigator (PI) and her colleagues indicated potential benefits from using a modified consultation approach to collaboration whereby providers and researchers jointly develop and modify the interventions to be used with children and their families. Building on this work, MDP staff provided consultation and training for providers, who then served as coaches for parents and early childhood teachers to help them implement the language-promoting strategies. This approach was intended to enable the MDP team to investigate how the model would operate in diverse real-world settings and to support the model's sustainability.

Model Programs and Providers

Kansas implemented its model in three programs (K1, K2, and K3) in Kansas, all of which were Part C programs serving children ages birth through 3. K1 served children in an urban county and directly employed staff to provide EI services in families' homes. K2 served children in a primarily suburban county, both contracting with and directly employing personnel to provide EI services in families' homes. K3 served children in both urban and rural areas where about 12% of the population lived below the poverty level. This program both contracted with and directly employed personnel to provide EI services in families' homes as well as regular preschool classrooms and family child care settings. The majority of providers at each Kansas program had 5 or more years of experience in their professional fields, with children ages birth to 5, and with early intervention; a large majority of providers in K1 and K2 had master's degrees and about half were licensed speech-language pathologists.

Participating Children and Families

A large majority of children in the Kansas MDPs had a primary caregiver who was White, and most caregivers (89% to 100%) had a high school degree or higher. Overall, 34% of children served in Kansas programs were identified as living in low-income households, and across programs, less than 10% of the children lived in an unemployed household. Children averaged 18 months of age when they began receiving EI services, and they began participating in the MDP at 26 months, on average. The percentage of participating children who were eligible for EI services because of a diagnosed condition ranged from 24% of children in K3 to 71% of those served in K2. Three-fourths of K2 children with a diagnosed condition had a speech-language impairment. The percentage of children eligible because of a developmental delay ranged from 28% to 76% across the Kansas programs, with K3 having the highest percentage. More than half of children scored more than one standard deviation below average on the developmental assessment conducted by MDP staff. On the tally of socioeconomic, biological/medical, and developmental functioning risk factors, Kansas families averaged 2.7, ranging from 2.5 for K1 families to 2.9 for K3 families.

Implementation Stages

Initiation. The Kansas MDP chose to partner with local agencies that had been collaborators in previous projects. Program coordinators were approached to determine their level of interest in the project. After a coordinator indicated that his/her program would like to be involved, regular staff meeting time was used to provide information about the model to the program's EI providers, offer them the opportunity to participate, and distribute a provider consent form. Providers were asked to read the materials and sign the consent form after the meeting if they wished to participate. Overall, program staff were reported to have reacted positively to the invitation to be a part of the MDP, and approximately 57 Part C providers consented to participate and actively worked with families to implement the model.

Preparation. During this stage, MDP staff members consulted with a former Part C coordinator, who helped the team think through the coaching model and how to implement it with the Part C agencies. The MDP team met with providers to educate them about the model and the study, and a site liaison was assigned to each program to monitor implementation and provide support and ongoing PD and coaching. Site liaisons for K1 and K3 were trained for 2 to 3 weeks before they began attending provider meetings and conducting joint meetings with them (a site liaison for K2 was not hired until year 2). The MDP team developed a manual that presented the model procedures in a parent-friendly way and that was applicable to both home and classroom environments. Providers were initially trained on the language-promoting strategies by MDP staff during a multiple-hour workshop. Each provider received a copy of the manuals and DVDs describing and giving examples of each strategy, were introduced to the MDP schedule and recruitment criteria and procedures, and were provided copies of the forms used to document model implementation and intervention fidelity. After initial training, providers met regularly with their MDP site liaison to receive support for their work with teachers and parents. Preparation activities were slow to begin in K1 because the MDP liaison left shortly after starting, delaying start-up until a new liaison was hired. The MDP team reported finding it especially challenging to begin the intervention with K2's largely contracted staff, who

received little support or reimbursement for their model-related time, but said K3 staff were able to quickly implement the intervention.

Initial implementation. After PD, providers began enrolling any children for whom they thought the model intervention would be appropriate rather than following a formal screening process. The MDP team planned to recruit 225 children and their families by the end of the first year, 75 at each site. By the end of year 1, 65 families were participating in the MDP, increasing over 5 years to 147 families and their children. K3 had early recruitment success, with its director reportedly playing an important role in early recruitment by encouraging all service providers to have at least three project-eligible children included in their caseload. Recruitment was slowest at K1 because the site liaison position was vacant most of the first implementation year, and because a significant percentage of the K1 population spoke Spanish at home and thus were not eligible for inclusion in the study because the assessment tools were appropriate only for native English speakers. Recruitment was difficult at K2 because services were delivered by contractors, there was no central person at the program office who encouraged providers to recruit children for the project, and as noted above, a site liaison was not hired for this program until year 2. Initial explanation of the project to families and MDP staff's baseline assessments of children took approximately two or three home visits lasting 1 to 2 hours each. After the initial assessments, Part C providers began to go over the communication strategies manual with parents, and parents began to implement the strategies during children's daily routines. Providers met with families either weekly or monthly. The MDP site liaison to a program offered initial support during this time to ensure that providers' questions about teaching parents the strategies were answered. After a provider had delivered the intervention for a few months, the MDP site liaison began providing feedback on how implementation and intervention were progressing.

Full implementation. Site liaisons met regularly with providers to support implementation of the model strategies with families and teachers. The Kansas team also developed checklists that providers completed about their visits with families, and parents completed a checklist indicating the frequency with which they used each intervention strategy and in what routines it was used. From these data, regularly updated "provider reports" were produced, depicting the status of each participating child and summarizing the information from the observation self-checklists. Site liaisons used the reports to see at a glance the strategies for which providers needed additional support and guidance. To monitor the progress of model implementation, MDP staff also held regular program staff meetings and accompanied providers on home visits. During them, providers introduced parents to project materials and the various intervention strategies. The process of using the intervention manual to guide parents' use of the intervention strategies was individualized, with providers proceeding at the pace appropriate for each parent. Activity cards that provided examples of how each strategy could be applied in specific daily routines were developed to supplement the content of the manual and DVD originally provided to parents. Parents' implementation of the strategies was assessed by MDP staff who, during a 30-minute observation period, documented parent and child communication. They later graphed the child's communication and language progress and the parent's use of various communication strategies and shared the graphs with the provider, who then shared them with the family.

Part C providers also worked directly with approximately 20 teachers across multiple programs who had MDP-participating children in their classrooms to implement the language promotion strategies with them. MDP-trained providers introduced teachers to all the project

materials, followed a pace appropriate for each teacher and classroom, and helped teachers use the strategies in ways that were appropriate to each child's developmental needs and fit within the curriculum and class schedule of routines. As teachers sought to increase their strategy use, they met regularly with the Part C provider serving the MDP children in their classrooms to obtain feedback and support in overcoming any barriers or challenges to strategy use they encountered. Providers also modeled strategy use and noted specific observations in which teachers used the strategies. The activity cards developed for use in working with parents also were provided to teachers to give them examples of how each strategy could be applied in specific daily routines.

Implementation fidelity. The Kansas model was intended to change providers' capacity to support parents in implementing evidence-based strategies with their children. Providers' self-reported fidelity was recorded on a checklist that was completed after each home visit; it indicated the model strategies they addressed with parents during that visit and the activities in which they taught them. The Kansas MDP leaders did not have a threshold definition of acceptable intervention fidelity; however, they indicated that while goals were set based on the individual needs of families and children, a possible benchmark for provider fidelity would be teaching three or more strategies across three or more daily routines. For some families, however, the benchmark might be set at one or two strategies in one routine. Providers guided parents to use a variety of communication strategies across their daily routines but they did not direct families to use the naturalistic communication strategies at a particular rate per session. Fidelity data indicated that on average providers taught about six and a half strategies (out of eight) across approximately five different routines. Both the number of strategies taught and the number of routines and activities in which they were taught were highest among K3 providers and lowest among K1 providers. Parent fidelity data, collected through independent observations in 30 minute sessions, indicated that across observations for all parents in the Kansas MDP, parents used an average of 5.8 strategies per minute, with 80% implementing at least three strategies per minute. The rate of parent strategy use was highest at K2 (7.4 strategies per minute) and lowest at K3 (4.0 strategies per minute).

Implementation Challenges

Kansas MDP staff reported experiencing implementation challenges related to providers, parents, and contextual factors.

Providers. Some implementation challenges that were said to influence implementation fidelity related to the extent to which providers were supported by their supervisors and to whether they were contracted employees. Contracted staff did not have office space or paid time for PD, coaching, or meetings with MDP site liaisons. Although provider turnover was not as significant a problem for Kansas as the other MDPs, some providers were lost to layoffs, particularly contract staff who had small caseloads.

Parents/families. Stressors in some families' lives were barriers to implementing the intervention with fidelity according to MDP staff. Many families participating in the MDP were said to have experienced multiple stressors, and the intervention sometimes had to come last during the visit, especially if communication/language was not parents' primary concern about their child. Adapting the intervention to such families and helping providers work with different types of families were reported challenges.

External context. Similar to Puckett, Kansas experienced challenges related to children's eligibility for Part C services. Some children who were deemed eligible and started receiving Part C services discontinued them after a time, in some cases because children had met their Part C goals and were no longer eligible. In such cases, MDP staff continued to support these families and children, who were estimated to be 30% of participating families.

Promoting continuity across Part C and B systems. At the outset of the MDP, to promote this continuity, Kansas staff selected Part C programs that were located in the school districts the participating children would attend for Part B services. School district administrators provided letters of support at the MDP proposal stage, before implementation. When children reached the 3-year-old transition point, families were approached to confirm their interest in continuing with the project and to give permission for the MDP staff to contact Part B program administrators. The Part C providers and the MDP site liaison described the project to the Part B program staff and asked if they would participate. MDP-trained Part C providers oriented some Part B providers to the MDP's purpose, their role in it, and the project materials. Each Part B provider received a copy of the manuals and DVDs describing and giving examples of each strategy and information on the Part C services the families had received.

As implementation unfolded, collaborating with the Part B programs was said to be influenced by two main factors. The first involved the differences in eligibility determination for Part C and Part B services. Children were recruited for the MDP through their Part C program, but as they aged, it became clear that a significant percentage of them were not eligible for Part B. Nonetheless, the MDP site liaisons continued to support these families in implementing the model strategies. Also, the Part B service delivery model was in some ways not compatible with Part C and/or the Kansas MDP approach. For Part B services, children were pulled out of their daily activities once a week to participate in brief individualized therapy. This did not afford an opportunity for collaboration between the Part B provider and the child's teacher or for work to support a child's communication and language abilities in natural settings. Further, many Part B providers objected to adopting the model strategies because they perceived it would add significantly to their workload, and they refused to collect data on strategy use more than quarterly. The MDP site liaisons continued to work with Part B-eligible families if the Part B providers and administrators were not supportive. For children who transitioned to cooperating Part B programs, MDP staff worked with Part B providers to support them in implementing model strategies with children and families.

VU/FSU

Model Characteristics

This MDP's KidTalk Tactics Project (KTTP) was a community-based early childhood language intervention model for children ages birth through 5 with significant language delays, and their families. The model's basic premises were that: (1) parents are their child's first communication partners, and strategies should be incorporated throughout routines and preferred activities at home and in the community to increase child language and communication outcomes; and (2) child care providers/teachers and early intervention service providers should support child communication across settings to promote generalization. The strategies promoted were adapted from enhanced-milieu teaching (EMT; Kaiser & Trent, 2007) and family-guided

routines-based intervention (FGRBI; Woods, Kashinath, & Goldstein, 2004). One of the key elements of KTTP was that knowledge and skills shared across team members supported implementation of a comprehensive communication intervention and specific instructional strategies for each child. Enhanced-milieu teaching and family-guided routines-based intervention, the foundations for this MDP, are both parent-implemented interventions. The VU/FSU team developed a staged approach whereby MDP staff first supported and coached families in their homes to use the interventions with their children and then moved to train other adults (e.g., teachers, child care providers) in children's lives.

Model Programs and Coaches

The VU/FSU MDP implemented its model with children and families in four programs: two in Tennessee (VU1 and VU2) and two in Florida (FSU1 and FSU2). One of the four programs was identified as a Part C program; others were mostly general early childhood education programs and as such offered both general and EI services in classroom settings. Both programs in Tennessee had classrooms and provided early intervention services in these classrooms as identified in children's individualized family services plan (IFSP) while also providing general early care and education programs. Both VU2 and FSU2 used a mix of employed and contracted EI professionals.

The VU/FSU MDP recruited children and families from these programs; however, they hired their own communication coaches who worked directly with participating families to adopt model strategies. Some EI program teachers and providers in the programs were trained by coaches to implement the model intervention strategies in the classroom; however, the primary implementers of the model with parents were the MDP-hired coaches, not staff who were employed or contracted by the programs. The VU and FSU sites shared coaches across their respective programs. Twelve coaches served children who attended or were served by the VU programs and four providers worked with children and families from the FSU programs. About half the coaches at VU and FSU held a bachelor's degree or bachelor's degree plus coursework; all other coaches at both VU and FSU held master's or doctoral degrees. VU's coaches primarily specialized in early childhood education, whereas FSU's providers specialized in speech-language pathology. More than half the coaches at both programs had 5 or more years of EI experience, with no coach having less than 2 years of experience.

Participating Children and Families

All primary caregivers in VU's programs identified as White, and 62% to 84% had a 4-year college degree, similar to the characteristics of FSU1's primary caregivers. In contrast, two-thirds of FSU2's primary caregivers identified as African American, and the majority had some college or a 2-year college degree. Across the VU/FSU programs, the percentage who lived in a low-income household ranged from 7% in VU1 to 100% in FSU2. No children were reported to be living in an unemployed household. The tally of socioeconomic, biological/medical, and developmental functioning risk factors showed an average of 3.1 factors were present for VU/FSU families, ranging from 2.5 and 2.8 for VU1 and FSU1 families to 4.0 and 4.6 for VU2 and FSU2 families. VU/FSU was unique among the MDPs in the relatively high number of children with severe disabilities and delays who were recruited, rather than children with the typical language delays the team had expected to serve.

Implementation Stages

Initiation. MDP staff identified potential partner agencies that reflected the types of providers and services that Part C families and programs used most frequently. Programs needed to have parents as key partners in model implementation and to offer the opportunity for collaboration in multiple settings in the child's natural environments. The two VU sites offered both center-based and home-based services, enabling coaches to work with both parents and teachers to implement model language promotion strategies. In Florida, coaches served as Part C providers and collaborated with the child's other Part C or center-based providers. This enabled coaches to help parents build communication teams with professionals who served their children and to help embed the intervention across time and settings. FSU's goal was to not only include a sample of children, families, and programs that reflected the realities that Part C providers face but also offer opportunities for collaboration and team building. Other considerations were the number of children served, the reputation of the programs as ethical, and demonstration of interest in partnering with the MDP. One of the MDP PIs was a board member at VU1 and initiated contact with program staff to determine interest in MDP participation. Both VU2 and FSU1 were longtime research and training collaborators with the MDP PIs. The opportunity to partner with the MDP team reportedly had been met with enthusiasm and requests by staff in all programs.

Preparation. The first implementation step was training the MDP-employed communication coaches on the model intervention, administration and scoring of related measures/assessments, and adult learning strategies for supporting and coaching parents and teachers. The 30-hour training included an initial intensive workshop for covering content, individualized practice and feedback working with children and families, and ongoing team support. A Fidelity of Implementation Checklist was completed for coaches' implementation of all model components by a PI or a project director, and the communication coaches continued to receive individualized feedback and support until each achieved at least 90% fidelity on each component. This support was provided to coaches weekly in 1- to 2-hour project meetings in which child/parent/teacher videos were reviewed and recommendations for practice suggested by all MDP team members.

During this stage, the VU and FSU teams faced the challenge of implementing a single model in separate states by holding quarterly cross-site meetings to coordinate efforts and to ensure that protocols were consistent. The MDP team also had weekly phone conversations, when they shared progress/changes with families via videos on a web-shared folder and used Skype to improve the quality of communication and develop personal relationships.

One important decision that the team had to address early in this phase was how to establish the point at which a parent had achieved an adequate level of competence in implementing the MDP strategies. The original conception of the intervention was for parents to receive the support of communication coaches in implementing model strategies for 24 sessions conducted over 3 to 6 months. This schedule was revised when it was clear that coaches needed to work with some families longer to achieve adequate implementation fidelity, particularly those with children who had significant cognitive as well as language disabilities. To ensure that implementation fidelity was maintained by the parents and to help them adapt the intervention as their children's communication abilities changed, support was phased out gradually.

Initial implementation. Maintaining cross-site communication during the first year was said to be a key factor in obtaining and incorporating the experience, evidence, and feedback from all sites into revisions that would strengthen the model. FSU and VU teams also each held their own weekly project meetings to process individual experiences with teachers and parents. Issues and information from these weekly team meetings were discussed during cross-site conference calls so procedures and protocols would be consistent across sites. Larger project issues also were noted during these calls and were explored more fully during quarterly in-person meetings. Halfway through the first implementation year, communication coaches were delivering the intervention to families in three of the four programs (FSU2 began later). Initially, parents received home visits once or twice a week, during which they were provided with a summary of the results of their child's initial assessments, conducted by MDP staff members. Using these summaries, coaches individualized the intervention, accounting for the goals and priorities of the family, and monitored the child's progress. Serving children with severe disabilities and delays required the team to modify some of the model's strategies and materials, including accommodating children who used augmentative and alternative communication devices. MDP staff initially spent from 2 to 6 hours per week with each family, a time intensity recognized as having implications for sustainability.

At the end of the first implementation year, VU had recruited 16 children into the MDP across both programs, and FSU had recruited 10, significantly fewer than the approximately 140 families and their children expected to be recruited by that time. The number of children recruited and served by the end of the MDP had increased to 27 for VU and 20 for FSU despite the fact that the MDP teams expanded recruitment at all four sites to include clinic-based programs.

Full implementation. Home visits made during full implementation involved parents being presented with written or pictorial descriptions about one or more intervention strategies to be used in daily routines. Coaches discussed the strategies with the parents and answered their questions, and parents practiced using the strategies while being observed and videotaped by an MDP staff member. During each session, parents chose routines to focus on, and coaches advised on how to embed the intervention in them. During and after practicing strategies, MDP communication coaches gave parents feedback and engaged in problem solving about further use of the strategies and materials. Parents and coaches jointly planned strategies to focus on until the next home visit. The expectation was that by the end of the intervention, parents would use the strategies daily across at least five routines each week.

As implementation progressed, MDP staff created an assessment report template to share initial assessment information with parents and to report progress at every 6-month assessment point. In addition to reporting a summary of services received, assessment scores over time, and comparative developmental information, one template section described skills the child was currently demonstrating and skills that typically would come next developmentally. Goals were then set to include work toward new skills. MDP staff developed secure, individual family Google pages, beginning in year 2, to share information and data with families and providers who were part of the child's communication team.

Parents provided communication coaches with informal feedback after each home visit and more formal anonymous feedback via a written consumer satisfaction survey. MDP staff used this feedback to give parents more options for intervention activities, including varying the

frequency of home visits and generating new mechanisms for advising parents on their use of strategies and materials. Parents completed the satisfaction survey after session 24 and then every 6 months. In year 3, MDP staff developed a more summative parent interview that was conducted and transcribed for analysis and reporting in 2013. Although no major conceptual or technical changes were reportedly made to the model during this stage, using individual child data as a guide, the MDP made minor adjustments to the order in which parents were instructed in the intervention strategies. FSU also developed and made available to families a Part B transition guide, and with parent permission, both sites archived video clips for use in training. In year 3, the team drafted the first version of the comprehensive KTTP manual during the cross-site meeting; final revisions were made in the summer and fall of 2010.

In addition to having communication coaches work with parents during home visits to implement the model, MDP-hired staff implemented a variation of the home-based and parent-implemented model with providers and teachers who worked with children in clinic and classroom settings. This model component involved separate, simultaneous tiered training for children's teachers and providers if requested by program staff. The training MDP staff offered to those who requested it included a 1-hour introduction to the project; instruction in core EMT strategies; four to six 2-hour group workshops, followed by four to eight individualized coaching sessions; and individual consultation and coaching on implementing the strategies with specific children.

Implementation fidelity. Early analysis by MDP staff showed that initial coach self-reported implementation fidelity ranged from 75% to 90%. Recognizing that the level and distribution of the skills needed to deliver the intervention to families naturally varied among the coaches, MDP staff determined that they needed to increase coach supports, such as having apprentice coaches shadow experienced coaches and practice in the field. Thus, by year 3, coaches were reported to be very experienced and able to achieve uniformly high fidelity, ranging from 90% for the VU programs to 97% for the FSU programs. Parent fidelity was measured by independent observations. For each strategy, threshold quality criteria had to be met to achieve fidelity, and overall fidelity was considered achieved if the parent met fidelity on at least 80% of the areas. Fidelity in implementing the EMT strategies by parents ranged from 75% to 100%, with 86% of parents reaching overall fidelity thresholds. Variations in the length of time it took parents to achieve fidelity were said to depend on a variety of child and family characteristics, including the severity and nature of a child's disability and the need for both the communication coaches and the parents to learn alternative modes of communication for some children. Additionally, some components of the model were more challenging for parents to implement with fidelity, and parents had trouble deciding how and when to use strategies in daily routines. With practice and feedback, however, they were able to implement with fidelity.

Implementation Challenges

VU/FSU experienced some communication coach and other MDP staff turnover, but unlike other MDPs, it reportedly did not affect implementation significantly. VU/FSU MDP staff did report implementation challenges related to parents and children, contextual factors, and implementation of an adapted model with teachers and providers.

Parents and children. Depending on the nature and severity of a child's disabilities and family circumstances, MDP staff spent up to 3 years working with some families, rather than the

3 to 6 months they thought would be typical. The natural course of children's development often required continued intervention support as coaches and parents adapted the intervention strategies to be appropriate to the needs of each child as he or she developed from infancy through preschool age. Some VU families also lived fairly far from the university and the coaches who provided the intervention, resulting in coach time and travel costs that were difficult given the MDP budget. An unexpected challenge for VU staff was that some families of children with disabilities or delays never enrolled them in Part C, resulting in some children turning 3 years old and "transitioning" into Part B preschool special education without ever having received Part C early intervention services.

External context. At the time the project was being implemented, the state of the economy was said to be "devastating," particularly in Florida. Families lost their homes and participating in the MDP was one of many competing priorities. Administrative and logistical barriers within programs also were said to be "severely challenging" to implementation of a comprehensive communication intervention model that emphasized a team approach that included caregivers and important teachers and professionals in the child's life.

Implementation with teachers and providers. Given the intensity of the training the MDP made available to teachers and providers to implement the strategies in classroom and clinic settings, expanding it to the large number of providers involved in delivering the multiple services children needed was reported by MDP staff to be infeasible. Also challenging was the fact that some teachers reportedly did not have the requisite foundational skills to use the language-promotion strategies with children, and many providers did not spend enough time with children to incorporate the strategies into their "primary therapy" agenda.

Promoting continuity across Part C and B systems. The VU/FSU transition approach focused on empowering families to be informed and confident advocates for their child's communication needs through the Part C-to-B transition, hopefully preventing a decrease or change in the amount and quality of the intervention that each child received. The MDP also planned to provide classroom consultation and individual feedback for a child's new Part B preschool teacher, assistants, and service providers that would include on-site modeling, practice, and coaching of model strategies. As MDP-participating children approached the transition, MDP staff contacted each child's Part B teacher and service providers with information about the intervention. However, the families could choose who would be on the child's transition team, and many but not all families chose to include MDP communication coaches in the transition meetings. The resulting transition experiences varied across programs and children. For example, all VU parents opted to receive Part B services, perhaps reflecting the greater severity of many children's disabilities, whereas FSU's participating parents had more varied experiences. Regardless of the specific outcome, the end of Part C services and supports marked a major and reportedly disruptive change for all families and communication coaches.

Implementation Outcomes

MDCC analysis of the implementation outcomes achieved by the C3 MDPs focused on the extent to which providers, teachers in some cases, and parents had demonstrated changes in their knowledge, attitudes, skills, and behaviors related to the early childhood language interventions (Fixsen et al., 2005). Assessing this aspect of implementation involved using data from each MDP's implementation fidelity measures for both providers and parents. At the organizational

level, consideration also was given to the extent to which there were changes in both formal and informal structures, processes, and cultures, focusing on the extent to which program leadership provided the "facilitative administrative support" (Fixsen et al., 2005) needed for a model to be implemented and sustained in participating programs and among participating providers. Given that the MDPs focused more on changing the knowledge, attitudes, and skills of providers than changing the host organizations, one would expect that implementation would have a stronger impact on the providers and parents than on the organizational structures and cultures of the programs hosting the model.[2]

In this section, consideration is given to research-based hypotheses regarding how variations in core intervention and core implementation components, and aspects of programs and program staff and of children and families, might help explain variations in implementation outcomes. These hypotheses are then assessed against the backdrop of C3's implementation experiences and outcomes.

It is important to note that the data collected for implementation outcomes were limited in the extent to which they could inform the hypotheses because the summary fidelity scores did not vary greatly. Generally, they showed that providers and parents were implementing the intervention strategies with high fidelity when aggregated across the length of model participation. This appears to reflect the ongoing coaching, monitoring, and feedback provided by staff of all the MDPs as a core element of their implementation approach. Although this is a strength of the MDPs, the lack of variation limits the utility of the fidelity measures for understanding implementation outcomes. Other limitations include small sample sizes, missing data, and self-reported fidelity.

Core Intervention Model Components

Hypotheses. Hypotheses were generated regarding how variations in key features of the models themselves might relate to variations in implementation outcomes using three key concepts from research on the diffusion of innovations (Rogers, 2003):

- Relative advantage—"the degree to which an innovation is perceived as being better than the idea it supersedes" (p. 229).
- Compatibility—"the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (p. 240).
- Complexity—"the degree to which an innovation is perceived as relatively difficult to understand and use" (p. 257).

MDCC staff hypothesized that model practices that were perceived to have a relative advantage over the current practices of participating programs and providers and those that were perceived to be both compatible with the implementation context and relatively less complex to

[2] A third implementation outcome that is critical in the model demonstration context is the sustainability of the model after the MDP ends; that is, the extent to which the destination organization maintained the core intervention components of the model. Whether or not model practices were sustained following the end of the MDP is the subject of a separate report: Wagner, M., Gaylor, E., Fabrikant, N., & Shaver, D. (2013). *Early childhood language intervention interventions: Lessons learned about model sustainment and spread.* Menlo Park, CA: SRI International. http://mdcc.sri.com/prod_serv.html

implement would generate more positive implementation outcomes (Rogers, 2003). Specifically, the following hypotheses were considered:

- MDPs that sought and received extensive input from providers before implementation would have better implementation outcomes because they would be able to address at the outset any perceived disadvantages in implementing the models.
- The time and effort required to implement the models would affect implementation in that providers would not adopt models they perceived to be time intensive—a relative disadvantage.
- The extent to which providers perceived the model strategies as complex—i.e., difficult to understand and implement—would affect implementation experiences and outcomes.
- Systems, programs, and providers that already were implementing practices that were compatible with a naturalistic, functional early childhood language intervention would have better implementation experiences and outcomes.

Results. Some of the hypotheses regarding the impacts on implementation fidelity of differences in core intervention components were supported by the experiences of the MDPs. Regarding the impact of ***obtaining input and feedback on implementation***, findings were generally consistent with the hypothesis. Both the Kansas and VU/FSU teams garnered significant input from providers and coaches as they developed and implemented model practices and subsequently documented successful implementation. Puckett staff did not report this kind of involvement by providers and experienced resistance in some programs. Regarding the hypotheses about ***perceived time and effort required by the model***, each MDP had some providers and administrators who questioned the relative advantage of the models because of the time involved in the home visits. Home visits were particularly challenging for providers at programs where state policies did not permit reimbursing them for associated travel, as with some Puckett programs. VU/FSU staff reported that both the time and intensity of working with families made it challenging to implement the model with a large number of families; however, the team also speculated that it was this very intensity of work with families that may have helped them reach fidelity. Thus, the time and intensity of working with families could possibly affect sustainability of the model by programs and providers that lacked resources to support some aspects of the models, particularly home visits. Some support exists for the impact of ***complexity*** in implementation. For all models, MDP staff found that providers could easily implement some strategies but that more complex strategies required additional support to reach fidelity. However, they also noted that implementation could be successful even in the face of these challenges with adequate coaching, monitoring, and feedback.

The MDPs did not report many issues related to the ***compatibility*** of their models with the Part C programs with which they worked. However, evidence suggests that some of the model characteristics that were shared across MDPs were less compatible with some contexts than others. For example, the time- and labor-intensiveness of home visits were particularly difficult for Puckett because that MDP's families were widespread geographically, and staffing mechanisms and reimbursement policies were disincentives to providing the intended intensity of home-based interventions. The interventions also may have been more compatible with the routines of providers who typically provided in-home services than of those who primarily worked in other settings. All the providers in the Kansas programs likely had experience

delivering EI services in children's homes, as did providers in half the programs with which the Puckett MDP team worked. Consideration was then given to whether compatibility may have contributed to the difficulties MDPs experienced in trying to work with Part B providers and systems when children transitioned to them. That all MDPs struggled with how to support continuity of strategy use across the Part C and Part B systems indicates that compatibility was a significant challenge.

Core Implementation Components

Hypotheses. The NIRN model identifies three core implementation components that are common among successfully implemented practices or programs and that are directly applicable to the early childhood language intervention MDPs: ***practitioner selection***—partnering with programs and services in the community and introducing the model to Part C and Part B programs and early intervention staff; ***PD, training, and support*** to implement the core intervention components with high fidelity; and ***ongoing coaching*** offered to providers, teachers, and parents in support of both model implementation and continuity in participation between Part C and Part B services.[3] The NIRN model also suggests that the ***ways these components are carried out within the purveyors' organizations*** could be important for understanding implementation. In the context of the C3 models, the following hypotheses were generated.

- Programs that had worked with an MDP before the project and/or were closer in physical proximity would be better able to implement with fidelity because the providers would be more familiar with MDP staff and the supports they could offer and have easier access to them (Fixsen et al., 2005).
- The organizations the MDPs came from (universities vs. nonprofit organizations) would affect implementation experiences and outcomes, primarily through presumed higher MDP staff turnover among university-based MDPs. MDPs that relied heavily on their own staff to implement the strategies would have better implementation outcomes in terms of provider fidelity but would see fewer changes at the program level and would be less likely to see sustained model implementation.
- All MDPs would benefit from their emphasis on providing extensive ongoing coaching and monitoring in achieving high fidelity and continuity in participation between Part C and Part B services.

Results. The evidence is meager and inconclusive regarding the hypothesis that MDPs would be more successful in achieving implementation fidelity with programs that they had worked with before the project and/or were closer in physical proximity to the MDP team. The data from the Puckett MDP, the only data available to assess this hypothesis,[4] suggest that although this MDP team involved a program with which it did not have a prior relationship and programs that were dispersed geographically, other factors reportedly had a greater influence on

[3] All MDPs needed to identify methods for effectively supporting communication and collaboration among parents, providers, and teachers to implement the model intervention strategies across the Part C and Part B systems as children transitioned. These strategies fall under all three implementation components (practitioner selection, training, and ongoing consultation) but are described in a separate section.

[4] Because fidelity was not examined by individual program in VU/FSU and because Kansas had worked with all three programs on previous projects, this hypothesis cannot be tested for those MDPs.

implementation outcomes at their programs than these factors. Regarding the influence on implementation outcomes associated with the type of organization that hosted the MDP, MDP staff turnover in the two university-based MDPs (Kansas and VU/FSU) was not higher than at the Puckett MDP, and there was no evidence that organization type (i.e., university vs. nonprofit) was related to implementation outcomes. Similarly, no particular advantage to implementation fidelity was found for the VU/FSU MDP, which relied on its own staff to deliver model services to families, nor did the MDPs report that these factors influenced implementation outcomes. Regarding the impact of provider training and support in implementing the model strategies, all MDPs reported that extensive monitoring and modifications to their implementation strategies were necessary to adequately support providers in their work with families. However, the monitoring and modifications were apparently successful, as evidenced by the high levels of fidelity for all three MDPs.

Characteristics of Implementing Programs

Hypotheses. Reflecting the NIRN-based conceptual framework that guides the MDCC's work, MDCC staff hypothesized that the characteristics of programs with which the MDPs partnered to host or sponsor their models and from which parents were recruited to participate would help shape how model strategies were implemented by providers and parents. Within them, the staffing pool from which service providers who worked directly with the parents came also could have an impact on children's language acquisition. The factors related to both programs and providers that could be expected to help shape implementation and outcomes include the following.

- Having a director and key administrators who were highly supportive of a model, who communicated that support to staff, and who maintained the model as a priority over time would provide invaluable support to a model's acceptance in a program. Because VU/FSU staff members were themselves recruiting participants from the programs and working directly with families, they did not need to rely on buy-in from an outside provider for successful implementation, as the Puckett and Kansas MDPs did.
- The programs participating in the MDPs either provided Part C early intervention services or through other auspices (e.g., Early Head Start) served young children and their families, some of whom received Part C services. Part C-related programs could have an advantage in MDP implementation because they would have more staff with specialized expertise pertinent to the MDP (e.g., speech-language pathologists). Although all MDPs delivered their interventions in families' homes, some programs the MDPs partnered with also provided services in classrooms, child care programs, and other settings. The home-based MDP interventions were hypothesized to be more compatible with the routines of providers who typically provided in-home services (common among Kansas and Puckett programs) than those who primarily worked in other settings, as did those in the VU/FSU programs.
- Programs can deliver EI services through staff they directly employ, by contracting with individual providers, or by contracting with other organizations to deliver specific services. The reimbursement levels for contract personnel often did not cover time for important but ancillary responsibilities, such as communicating or teaming with other EI professionals, practices that could support stronger intervention implementation.

Programs with contract personnel also could experience higher staff turnover, which could hinder implementation fidelity and providers' ability to develop and sustain relationships with parents.

Results. These hypotheses were not expected to be relevant to the VU/FSU MDP, because it hired its own staff to implement the model strategies directly with parents. Findings for the other two MDPs, based primarily on qualitative analysis, were inconclusive regarding these hypotheses. Regarding the impact of ***administrative support***, MDPs generally reported high support and buy-in from programs, yet implementation experiences varied across the programs, suggesting that this factor may be important for high fidelity in some circumstances but not all. A second hypothesis was that ***Part C programs*** would have better implementation outcomes than other kinds of programs, yet all Kansas programs were identified as Part C but varied in their implementation fidelity. Puckett's P1 and P3 also were Part C programs but had the highest and lowest fidelity, respectively, among Puckett's programs, seeming to refute this hypothesis. The hypothesis that programs having ***experience serving children with disabilities and implementing home-based and/or parent-implemented interventions*** would more readily achieve implementation fidelity had some support in the Puckett MDP,[5] where P1 and P4 providers typically delivered services in children's homes and had the highest provider fidelity across Puckett's programs. Another hypothesis suggested that programs with ***more specialized staff*** would have better implementation outcomes. However, this was closely related to program type and seemed to be relatively unimportant for implementation. Finally, the hypothesis that programs that ***employed their staff directly***, rather than mainly having contracted staff, would experience better implementation outcomes,[6] suggested that P1, P2, K1, and K3 would have the highest provider fidelity. This hypothesis had some but not consistent support in the fidelity data.

Characteristics of Implementing Providers

Hypotheses. Both the programs hosting the C3 models and the individual providers implementing them represent the "destination" for model implementation identified in the NIRN framework. Thus, although programs provide the organizational context for implementation, the characteristics of individuals delivering the interventions to parents are important to examine and may well influence implementation and intervention outcomes. Here, the focus is on only a subset of providers at the participating programs or the MDP-hired coaches—i.e., those who were trained in the MDP strategies and served participating families and children. Across all MDPs, 94 providers/coaches implemented the models with families, including 21 providers at Puckett's programs, 57 providers at the Kansas MDP's programs, and 12 and 4 communication coaches at the VU and FSU programs, respectively. Hypotheses about how variations in providers could relate to implementation and intervention outcomes are presented below.

- Providers who had more education and training, particularly in relevant disciplines such as speech-language pathology or early childhood or special education would have more content-based knowledge to support their implementation of an early childhood language intervention. Further, some research shows that better-educated providers may

[5] Because provider fidelity was aggregated for VU's and FSU's providers and all Kansas providers were Part C providers, examining this hypothesis for these programs was not possible.

[6] This hypothesis does not apply to VU/FSU because that MDP employed its own communication coaches to deliver the intervention to families.

more readily consider adopting new evidence-based practices (Aarons, 2004). An alternative hypothesis is that early childhood specialists would have an easier time delivering home-based interventions.

- Providers with more years of experience in a field would be expected to implement an intervention with more fidelity.

Kansas' providers and Puckett's P3 providers had higher levels of education than providers in other programs, with most of them having graduate degrees. The VU programs and P1 had more early childhood specialists relative to the other programs. The Kansas providers had the most experience in working in their disciplines, working with children ages birth to 5, and working in EI. VU/FSU providers also had extensive experience on average and may have been more familiar with their intervention than other MDPs' providers; thus, they would be expected to implement the model with higher fidelity. Overall, Puckett's programs had providers who were fairly new to EI, and the majority had less than 10 years of experience. They might have required more training than other MDPs' providers to achieve implementation fidelity.

Results. With more providers than programs, quantitative analysis results could be used in exploring hypotheses related to the relationships between provider characteristics and implementation fidelity. No consistent or statistically significant associations were found between provider or parent fidelity and ***provider education level*** (bachelor's, master's, or doctorate degree): Across all MDPs, providers with ***backgrounds in early childhood special education, child development, or social work*** achieved higher provider fidelity than those with a specialization in speech-language pathology, although these associations also were not statistically significant given the small sample sizes. However, qualitative data from the MDPs also generally supported the contribution of providers having appropriate backgrounds to more readily achieving implementation fidelity. Analyses of the relationship of ***years of providers' experience*** working in their respective disciplines, in early intervention, and with the birth to age 5 population showed (1) these factors were positively associated with levels of provider fidelity for the Kansas MDP, (2) years of experience in early intervention was positively associated with parent fidelity for one Puckett program, and (3) there were no significant relationships for VU/FSU, although the sample size there was smaller. However, VU/FSU was the only MDP that showed a statistically ***positive association between provider and parent fidelity***, which supports the expectation that parents whose providers had a good understanding of the importance of the strategies and the ability to effectively communicate them to parents would have higher parent fidelity. Anecdotal evidence also suggested that providers who were more explicit or directive may have helped families reach fidelity sooner. Despite these hypotheses, it is clear that other provider characteristics that were not measured (e.g., the ability of providers to engage families and be responsive to their needs) also may have influenced implementation and intervention outcomes.

Characteristics of Participating Children and Families

Hypotheses. Because the primary caregivers in participating households were the direct implementers of the model intervention strategies with children, they were expected to have an influence on implementation fidelity and child outcomes.

- The home visiting literature suggests that parents who are younger, have less education, and have more household stressors are more likely to miss appointments, be wary of

strangers or practitioners in their home, and be less likely to establish a working alliance with practitioners (Wagner, Spiker, Linn, Gerlach-Downie, & Hernandez, 2003). [7]

- Families with fewer risk factors might have better implementation outcomes because they could participate more consistently and be more engaged in provider visits (improving provider fidelity) and invest more time and energy in implementing the strategies they were learning (improving parent fidelity) (Duggan et al., 2000; Hill, Brooks-Gunn, & Waldfogel, 2003; Korfmacher, Green, Spellmann, & Thornburg, 2007; McGuigan, Katzev, & Pratt, 2003; Wagner et al., 2003).
- Finally, child characteristics such as gender, age, disability, health, and functional skills may have affected the ability of caregivers to implement a model with fidelity as well as outcomes. For example, children with higher developmental scores when they began the MDP might have better implementation outcomes because they would be more responsive to the strategies, thereby reinforcing and encouraging providers and parents in implementing them (Miller, Leddy, & Leavitt, 1999).

All programs had large majorities of primary caregivers who identified as being White, and the average age of primary caregivers was over 30 for most programs. Overall, Puckett's families were more prone to have a cluster of characteristics that may have made achieving positive implementation and intervention outcomes challenging. Children in the Puckett programs, particularly P3, were less likely than those in other programs to have their biological mother as their primary caregiver, and P1 had the highest percentage of children in adoptive or foster care. The Puckett programs also had primary caregivers with lower levels of education and were more likely to be unemployed than other programs.

The average age at which children entered EI services varied widely across programs, in part reflecting the disabilities of the children they served. Many VU children began EI services as infants, having diagnosed genetic disorders that were identifiable before or shortly after birth. In contrast, many Kansas children were eligible for EI services for speech-language impairments, which would not be likely to arouse concern until the children passed the age when language normally develops. Other child-related demographic factors did not vary widely across MDPs and thus would not be expected to meaningfully influence implementation or intervention outcomes. However, children's developmental test scores were notably different across MDPs, with children from the two VU programs and FSU2 having particularly low baseline scores on developmental tests. In contrast, P4 children's mean score on one language subscale was in the average range for the general child population, and they had the highest scores on both language subtests.

Results. The ***number and types of risk factors in the household*** and the ***child's developmental level*** at entry were hypothesized to affect implementation outcomes. Only for the Kansas MDP were significant associations found between child and family characteristics and parent fidelity as hypothesized; Kansas families with more risk factors had lower parent fidelity,

[7] Another household factor that may have influenced implementation and intervention outcomes is the language spoken in the home. Most families reported English as the home language, although some families spoke both English and another language at home, including 25% of VU2's families, 21% of FSU1's families, and 18% of P2's families. Only children who were exposed to English at home were included in the sample because the assessments were valid only when administered in English.

and children with higher Mullen scores at entry had parents with higher fidelity. Beyond the associations between fidelity and family and child risk, MDP staff elaborated on other dynamics that might have come into play in shaping parent and provider fidelity, including parents' responsivity during home visits, the regularity of their participation in home visits, and their level of buy-in for the intervention, none of which were measured systematically.

In summary, the data demonstrate that Part C providers in Kansas and Puckett and communication coaches in VU/FSU could implement their respective models with fidelity, as could parents who were taught the model strategies. However, identifying robust predictors of provider and parent fidelity was not feasible because of the small sample sizes, missing data, lack of variation in fidelity measures within programs, and lack of a common metric of fidelity across MDPs. The relationship between various factors and implementation outcomes is necessarily complex, and it was not possible to separate the impact of, say, program reimbursement policies and provider years of experience on provider fidelity. Finally, because the MDPs focused more on changing the knowledge, attitudes, and skills of providers than changing the host organizations, it was not surprising that impacts on the organizational structures and cultures of the program themselves were reportedly negligible.

Child Outcomes

The assessment of the child outcomes associated with the C3 models focused on improvements in children's language and communication over time, progress toward meeting Part C goals, and for some children, a smoother transition to Part B special education services. For the purposes of this brief, measures gathered when children began participating in the MDP and when they were 36 and 48 months old were included. MDCC's analysis of children's language/communication skills and their respective measurement instruments included:

- Prelinguistic communication—Early Communication Indicators of Individual Growth and Development for Infants and Toddlers (ECI-IGDI; Greenwood, Carta, Walker, Hughes, & Weathers, 2006). This measure is based on a 6-minute play-based session which is coded for key behaviors including gestures, vocalizations (unintelligible verbal utterance), single-word utterances, and multiple-word utterances (intelligible utterances). A weighted total communication indicator score is calculated, with more complex words and behaviors having more weight.
- Receptive language—Preschool Language Scale, Fourth Edition (PLS-4) Auditory Comprehension Scale (Zimmerman, Steiner, & Pond, 2005). The PLS-4 is a normative-based measure providing a score that indicates the extent of the discrepancy between a child's performance and the norm for children in his or her age group.
- Expressive language—PLS-4 Expressive Communication Scale (Zimmerman et al., 2005). See above.
- A language sample that was analyzed for total number of utterances, total number of intelligible utterances, mean length of utterances (MLUs), and the number of different words uttered.

Across the programs, children's raw scores increased on all measures, and for most programs standard scores on the PLS-4 increased from entry into the MDP to 36 and 48 months.

PLS-4 scores declined for some children, which is not uncommon for children with disabilities. It is important to note that some children had quite severe disabilities, including cognitive impairments, that may have affected other areas of development in addition to speech and language and that the prevalence of these children differed markedly across programs. In addition, children began the MDP at widely different ages, ranging from 5 to 36 months. Regardless of the characteristics of participation children at entry, many of them improved in their language and communication abilities. Without an experimental design, however, it is not possible to know how children would have developed in the absence of the model intervention. Therefore, it is not possible to attribute gains or declines in scores to participation in the MDP.

The outcomes achieved by each MDP are summarized below, followed by an examination of factors that may have contributed to these outcomes.

Outcomes Achieved by Each MDP

Puckett. The children served by this MDP generally scored in the middle range on language assessments relative to the other MDPs. For example, the weighted ECI-IGDI raw scores at baseline and 36 months were 6.7 and 13.5, compared with the higher scores of Kansas's children (8.8 and 15.7) and the lower scores of VU/FSU's children (4.8 and 10.1). The same pattern was apparent regarding the change or growth in scores from baseline to 36 months and the unit change per month of children's enrollment (6.8 and 0.7 for Puckett, compared with 6.9 and 0.6 for Kansas and 5.4 and 1.1 for VU/FSU). Growth scores at 48 months showed a similar pattern of the relative scores of the three MDPs, as did scores on the language sample. Among Puckett's program, P1's children clearly had the lowest scores on the majority of measures, both at baseline and at later measurement points. P4's children, on the other hand, consistently had the highest scores among Puckett programs, both in terms of levels of performance and improvement in performance over time. For example, the PLS-4 standard scores at baseline were 80.0 and 99.5 for P1 and P4, respectively, and 70.4 and 99.1 at 36 months. Difference scores for children in the two programs averaged -9.6 versus +0.04, and the units change per month of participation were -1.6 and 0.2.

Kansas. As noted above, this MDP served children whose language skills were generally higher than children participating in the Puckett or VU/FSU programs. For example, the PLS-4 auditory comprehension standard scores were 88.1 and 89.2 at baseline and 36 months for Kansas children compared with 86.4 and 83.2 for Puckett children and 71.8 and 72.2 for VU/FSU children. Further, scores were fairly comparable across the three Kansas programs. For example, the PLS-4 auditory comprehension standard scores at entry were 83.9, 88.4, and 89.9 for the three Kansas programs, and the unit changes per month from baseline to 36 months were 0.0, 0.3, and 0.3. Despite the narrow range of variation across Kansas programs, K2 children often had the highest scores on the language measures. For example, this was true for both the raw and weighted ECI-IGDI scores and the difference and unit changes scores at 36 months. They also did not have the lowest score among the three programs on any measure. In contrast, both K1 and K3 frequently had the lowest score on a given measure and infrequently had the high score on either skill level or skills growth.

VU/FSU. Children served by the VU/FSU MDP had the lowest scores of the three MDPs on the weighted and raw ECI-IGDI measure at baseline and 36 months; the raw and standard PLS-4 scores at baseline and 36 and 48 months; and on the MLUs, number of different words used,

total utterances, and total intelligible utterances measured in the language sample at 48 months. However the generally low baseline scores in some cases were followed by the highest level of growth overtime. For example, VU/FSU children had the largest growth in the raw ECI-IGDI difference score between baseline and 36 months and the largest unit change per month in both the raw and weighted measure at 36 months. However, VU/FSU children also had the smallest change per month of children's participation on the raw PLS-4 measure at 48 months.

Factors Related to Variations in Child Outcomes

We hypothesized that child outcomes would be associated with parent fidelity and, to a lesser extent, with provider fidelity, depending on the nature of the models' theories of change. Additionally, children with less severe disabilities and who had families with fewer risk factors were hypothesized to make greater outcome gains. However, it was also hypothesized that children with lower scores at entry would make greater gains because they were starting so low and were receiving intensive supports from parents and providers.

Implementation fidelity. As expected, there was support for an association between parent fidelity and greater gains in children's language and communication skills. For example, children in P2 made the greatest ECI-IGDI and expressive communication gains at 36 months within Puckett's programs and had parents with the highest fidelity scores. The relationship was similar for K2's children and parents. In addition, in their own analyses, the MDP teams reported that higher strategy use among parents was significantly related to children's communication outcomes. There was less support for an association between provider fidelity and child outcomes; however, the analyses required to effectively examine these relationships were not possible due to limited sample sizes, missing data, and limited variation in provider fidelity data. The fact that parent fidelity was associated with child outcomes is consistent with the theory of change in naturalistic and functional language intervention models. The parents were the primary agents of all model interventions and thus would be expected to have the greatest impact on child outcomes.

Children's disability and family risk factors. There was some support for the influence of children's functioning and family risk factors on child outcomes. For example, children in FSU1 showed the greatest gains on the ECI-IGDI measure and began the MDP intervention with the highest Mullen scores and lowest number of risk factors within the VU/FSU participating children. In contrast, children in P3 had the lowest Mullen scores at entry and demonstrated gains in standard scores on all three PLS-4 scales.

Core intervention and implementation components. Considering how variations in core intervention and implementation components related to differences in child outcomes was not feasible for many of the same reasons that predictors of implementation outcomes were difficult to identify—small sample sizes, missing data, and lack of variation in the implementation components and implementation fidelity. Another barrier to understanding additional influences on child outcomes is the confounding of differences in models and in populations served. For example, because VU/FSU's children had more severe disabilities and children who participated in Kansas had less severe disabilities, it was not possible to disentangle this factor from differences in the two MDPs' models in explaining variations in their child outcomes.

Without an experimental design, it is impossible to attribute either gains or declines in children's scores to a component of an MDP. However, the data do suggest that parents' use of

and comfort with the MDP strategies increased over time and were associated with overall gains (in particular, raw scores) in children's receptive, expressive, and functional communication.

Lessons Derived from the Early Childhood Language Intervention MDPs

This section addresses the overarching purpose of the MDCC: gleaning insights into how the model demonstration process can be strengthened as OSEP continues to exercise its model demonstration and technical assistance authority. It also points out, when quantitative and qualitative data from the MDPs permit, ways their experiences might inform future efforts to work with programs, providers/teachers, and children and families within the Part C system to promote the language development of children with disabilities.

Components of MDPs' Models and Implementation Strategies

Several lessons have emerged regarding some of the models' intervention and implementation components, as described below.

Model similarities appear to have outweighed differences, as reflected in similar levels of implementation fidelity. All the MDPs sought to improve children's language development by teaching functional, naturalistic intervention strategies to parents, who then were to implement them at home with their children, yet each MDP concentrated on different elements of those common approaches. Analyses considered the hypothesis that model components that were perceived to have a relative advantage over the current practices of participating programs and providers/teachers and those that were perceived to be both compatible with the implementation context and feasible to implement might generate more positive implementation outcomes (Rogers, 2003). However, differences in the models, described earlier, did not translate into differences in measures of implementation fidelity. This may suggest that all the models were perceived by parents and providers/teachers to have *enough* relative advantage over current practices, were compatible *enough* with their contexts, and were feasible *enough* to implement that they *could* be implemented with fidelity.

Despite reaching similar levels of fidelity, doing so was more difficult for some MDPs, for some programs within MDPs, and for some model components than others. For example, all models involved working directly or through providers with parents via home visits. All discovered that the time- and labor-intensiveness of home visits was an obstacle that needed to be overcome in implementing the model. However, that obstacle was more difficult to overcome for Puckett than the other MDPs. Puckett families were widespread geographically, and staffing mechanisms and reimbursement policies discouraged providing the intended intensity of home-based interventions. Those mechanisms and policies also may have implications for the sustainability of that model. In contrast, VU/FSU hired its own communication coaches rather than relying on Part C providers, so there was no reimbursement issue. However, this strategy, too, has implications for sustainability in that there was no evident source of financial support for communication coaches after the MDP ended.

There also is some support for model complexity and compatibility as factors in implementation, in that all MDP staff reported that providers and parents could easily implement some strategies but that others required additional support to reach fidelity. Further, a key element of the VU/FSU model was the promotion of a communication team approach as a way

to increase the odds that the model language promotion strategies would be supported across multiple settings. However, MDP staff reported significant administrative and logistical barriers that limited the amount of teaming that occurred, even though the language-promotion strategies themselves were implemented by parents with fidelity.

A coaching-based PD model and the need to adapt the model to implementation contexts were perceived by MDPs to be important contributors to successful implementation. All MDPs reported that extensive monitoring and modifications to their implementation strategies were necessary to adequately support providers in their work with families. Ultimately, however, Puckett staff reported success with their training and coaching process and viewed it as a facilitating factor for implementation fidelity. VU/FSU staff identified one of the strengths of their model as being able to take elements from both EMT and FGRBI as core intervention components and integrate them through frequent communication and iterative improvement. Although the VU/FSU approach required that providers learn two sets of skills, implementation included significant training and ongoing support for them to reach fidelity.

The tools and materials the MDPs developed helped providers and parents use the language-promotion strategies independently and may help them continue to do so in the absence of the MDPs. Each MDP produced a variety of tools that garnered support and enthusiasm on the part of both providers and parents in using the model strategies. For example, the Kansas MDP developed a manual that presented model procedures in a parent-friendly way that was applicable to the home environment as well as the classroom and DVDs that described and gave examples of each language-promotion strategy. These materials both facilitated model implementation and could be used in training new providers to sustain the model.

Differences in staffing and PD strategies have implications for sustainability. MDPs differed in how they imparted language-promotion strategies to parents. The VU/FSU MDP hired and trained its own communication coaches to work directly with parents and achieved high fidelity in that work, but it built little capacity for providers to work directly with parents and children in their homes. Puckett staff provided PD and coaching directly to providers, as did VU/FSU in its on-line PD program. Some number of those trained providers could be expected to continue imparting the model strategies to parents. Kansas MDP staff used a train-the-trainer model in delivering PD and coaching to Part C providers, who were then capable of extending their learned knowledge and skills to child care providers and teachers. This PD/coaching model most clearly addressed the need for capacity building as a foundation for model sustainment.

Characteristics of Implementing Programs and Providers

We hypothesized that several literature-based factors might be potential influences on implementation outcomes (Dinnebeil, Hale, & Rule, 1999): a program's administrative support for the MDP, the nature of the program (Part C or general early childhood program), the settings in which a program typically provided services, and reimbursement and staffing policies. After reviewing both the qualitative and quantitative evidence, the following conclusions were drawn.

Because the interventions were delivered one-to-one by providers in the home, most characteristics of the programs with which providers were affiliated appeared to be less critical to implementation than the more proximal characteristics of providers and families. For example, one program's director, although verbally supportive, reportedly did not create a "culture of learning" that would have supported more enthusiastic adoption of the

model, preferring to give providers relatively free rein in working with their families. Nonetheless, providers in this program self-reported high fidelity, as did providers in all programs, suggesting that administrative support or its lack may not translate to the provider/practice level. However, one factor that was identified as important to consider when implementing home-based, parent-implemented models was a program's personnel and reimbursement policies. MDPs' qualitative data indicated that having employed rather than contracted staff improved implementation fidelity, with the caveat that this finding could have "interacted" with provider buy-in.

MDP staff considered the characteristics of providers working with parents and their children to be the most salient influences on implementation success; fidelity analyses revealed a more complex picture. There is literature to support the positive impact on implementation outcomes of a variety of aspects of a provider's background (e.g., having more specialized skills, more experience working with families in their homes, or more years of experience working with children ages 0–5). Of these hypothesized influences, only having a background in early childhood special education, child development, or social work was associated across all MDPs with providers achieving higher fidelity than providers with a specialization in speech-language pathology. The length of providers' experience was positively associated with provider fidelity only for Kansas. For Puckett, there was one positive association between providers' years of experience in early intervention and parent fidelity. Anecdotally, MDPs reported that providers' willingness to engage and learn new practices seemed to be one of the most important factors, although it was not systematically measured in the project. MDP staff also reported that providers who could develop positive and engaging relationships with parents and family members seemed to have better implementation outcomes.

Characteristics of Implementing Families and Their Children

We considered a variety of hypotheses regarding the influences the characteristics of the families and children participating in the MDPs might have on implementation experiences, and concluded the following.

Family and child circumstances were often challenging throughout the MDPs, from recruitment to program participation. All MDPs experienced challenges in recruiting the number of children they expected to serve, often because of multiple family stressors resulting from financial circumstances, the strains of raising and meeting the service needs of a child with a disability, single-parenthood, and a variety of other factors. Although MDP staff persisted in their recruitment efforts, they eventually reached only about two-thirds of their intended sample size. Once families began the intervention, MDPs also reported needing to adapt to family circumstances to retain them in the intervention.

Although the capacity of parents to implement intensive interventions varied, 80% or more of them met the fidelity criteria. Although the number and types of risk factors in the household and the child's developmental level at entry were hypothesized to have affected implementation fidelity, for the most part, the data did not support these hypotheses. Only for the Kansas MDP did families with more risk factors have lower parent fidelity, and children with higher Mullen scores at entry have parents with higher fidelity. Some support for the influence of children's development at entry and their risk factors on child outcomes was found. However, in other cases, these hypotheses were not supported. These data suggest that the MDPs' models can

be used successfully with children of varying abilities and disabilities as long as adequate supports are in place for providers and parents.

The dynamics of providers' and parents' interactions and the nature of a child's disability helped shape implementation outcomes. Beyond the associations between fidelity and family and child risk factors, MDP staff suggested other dynamics that may have helped to shape parent and provider fidelity, which in turn may have influenced child outcomes. They suggested that parents who related well to their provider and worked together as a team had higher fidelity, as did parents who more actively participated in the home visits. Other factors were parents' consistent participation in home visits and the level of parent buy-in. Other child factors mentioned by MDP staff included the child's identified disability. For example, for children with autism spectrum disorders, both providers and parents first had to support the children's overall engagement and provide positive behavior supports before tackling specific communication strategies. There also may have been an interaction between providers' experience and skills and the children and families participating in the MDP that suggested a more complex relationship. Providers with more specialized experience working with children with disabilities may have been more successful working with children with Down syndrome than other providers, whereas those with more experience working with children at risk may have been better at implementing the model and supporting parents in the home.

Systems and Contextual Factors

Multiple factors came into play when model implementation occurred in real-world environments—factors that were not under the control of the MDPs or their programs or were not anticipated at the outset of the project. These factors included the infrastructure of the service systems in which the MDPs worked and the financial turbulence of the time period.

Perceived differences in the fundamental emphases of the Part C and Part B systems were serious obstacles to promoting continuity in the use of model strategies among transitioning parents and children. All MDP staffs reported challenges in attempting to work within a Part B system that focused on delivering instruction to children via a program or in a classroom when their models were designed to deliver a set of child- and parent-focused strategies in naturalistic settings as part of daily routines. However, they also learned that they could have been more explicit with Part C and B staff that the models were meant to be continuous interventions involving both programs and that they intended to promote the continuity of families' strategy use throughout their participation. Clearly communicating this expectation early on may have prompted discussions of possible barriers and of supports that needed to be in place to achieve the intended continuity. Unable to eliminate the systemic barriers, some MDPs focused on empowering parents to communicate their child's abilities and their preferences regardless of the system serving them. Also, the VU/FSU MDP learned that administrative and logistical barriers between systems and providers severely challenged its model's emphasis on multidisciplinary teaming in maximizing a child's exposure to the communication strategies across contexts.

MDPs needed to adjust to contextual influences that were beyond their control. Many programs experienced ***high provider turnover***, which in some instances threatened the continuity of intervention for families. It also has implications for sustainability in that there would need to be resources in place over time to train new staff to replace trained providers if a

model is to be sustained. ***Policies*** related to reimbursement for travel to home visits, meeting time, and other aspects of the models restricted some aspects of model implementation. Also during the MDPs' implementation period, the ***economic recession*** was severe, and the MDPs were reportedly seen by some families as competing with more fundamental priorities in their lives.

Learning Paths

The fundamental purpose of the MDPs was to learn what it takes to establish evidence-based models in real-world contexts. Lessons derived from their experiences in model demonstration include the following.

Collecting and using multiple types of data served the formative development process of the MDPs. The MDPs solicited input and feedback on their models in many ways and used the information to revise both intervention and implementation components over time. Data collected via progress monitoring tools, observations, implementation checklists, and PD evaluations encouraged the MDPs to strengthen PD and to adapt procedures in accordance with staff and organizational preferences and needs.

Collaborative learning can support implementation and model refinement. To become more intentional about their own learning, some MDPs benefited from holding regular staff debriefings to consider their data and identify implications for their models' core intervention and implementation components. However, holding meetings for staff reflection and learning was more difficult for the VU/FSU team than other MDPs because of its two-state implementation field. Weekly phone conversations and using Skype were said to be effective in promoting collaboration. The Puckett MDP also gained what it reported to be valuable feedback on its PD strategy through its emphasis on providers reflecting on their experience and then sharing those reflections with each other and MDP staff.

Despite generating these implementation findings, it is important to note that the analyses reported here were limited in several ways. First, the metrics and measures of implementation fidelity differed by MDP, creating challenges for cross-MDP comparisons. Further, most fidelity measures were based on providers' and parents' self-report and may not have been sensitive to actual differences in implementation fidelity by parents, providers, and programs. The relatively small number of children and families participating in the models and for whom data were available also limited our ability to statistically analyze MDP- and program-level factors related to child outcomes. Nonetheless, information culled from both qualitative and quantitative data highlights the lessons learned from the C3 MDPs as they implemented their early childhood language intervention models. Some lessons are unique to C3's experiences, and others will continue to inform OSEP's and MDCC's work with successive cohorts. As MDCC continues its work, the experiences of cohorts 1, 2, and 4 will be synthesized with those of C3 to draw lessons that apply to a broad range of interventions and implementation contexts within OSEP's model demonstration program.

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