



Progress Toward a Multisectoral Community Intervention Approach to Prevention of the Word Gap

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Abstract

Children learn language through the interactions they have with their parents/caregivers beginning at birth. Hart and Risley (1995) discovered an inequity in the home language input children received from parents/caregivers. Children reared in low-income families received less input (conversations, turns) from parents than did children reared in more advantaged families. Less language input was linked to a disparity in children's vocabulary learning by age 3. The long-term result of this social determinant of early language/literacy learning is a life trajectory of poor educational, economic, and health attainment for many children in families with limited resources, at vast cost to individuals, communities, and the nation. What is needed is an approach to word-gap prevention that is capable of achieving positive individual, community, and population outcomes. Translating research into practice, we developed the *Bridging the Word Gap Community Action Planning Guide* (BWG-CAPG) using a combined behavior-analytic, community psychology, and public health framework for this purpose (Greenwood et al., 2017). We also developed a progress-monitoring measure, the online BWG Community Check Box Evaluation System, to provide feedback on a community's actions and progress in implementing their plan. Results from an initial pilot investigation within and across three community sectors in a large urban city were promising. BWG Community Check Box results indicated a number of desired outcomes: (a) capacity development and mobilization, (b) community implementation actions, and (c) community changes in practices, programs, and policies. Implications are discussed.

Keywords Language environment inequity · Word gap · Vocabulary · School readiness · Community action · Multisectoral partnership · Public health · Prevention science

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Society faces a lingering question of what to do about the disproportionate number of children living in families with incomes below the federal poverty threshold and communities with large proportions of these families who are not ready for school, struggle to learn to read, and fail to achieve success in school (Hoff, 2013; Peterson et al., 2018; Walker et al., 1994). Prior to the discovery of the 30-million-word gap in children birth to 3 years of age (Hart & Risley, 1995), intervention and prevention efforts (i.e., policies, programs, and practices) focused exclusively on remedial services for disadvantaged, low-income eligible children beginning in preschool with programs like Head Start (Head Start Act of 1965) and Title 1 beginning in kindergarten (Elementary and Secondary Education Act of 1965).

Hart and Risley (1992, 1995, 1999) reported finding an inequity in the quantity and quality of talk—the language adults used—with children in poverty (which they identified as families receiving welfare) compared to children from more economically advantaged backgrounds, identified as working-class and professional-class families. In the homes of the children in their sample, they conducted hour-long, monthly observations that included audio recordings of all conversations and coded interactions in terms of behaviors and contexts. They reported that by age 10–11 months, the size of children’s spoken vocabulary (unique words) began near zero for all socioeconomic groups; however, by 17–18 months of age, the groups began to diverge in the number of new words children were using each month. Growth in new vocabulary positively accelerated in the two advantaged groups, whereas the uptick in the poverty group was much slower and flatter. By 36 months, the cumulative difference between the children experiencing poverty and the children in the most advantaged group (professional families) was 591 unique words (525 vs. 1,116). Associated with children’s rate of language acquisition was a covarying inequity in the number of words children heard addressed to them by their caregiving adults. They estimated that children in poverty were exposed to 30 million fewer words by age 4 in their family conversations and interactions than the most advantaged children (i.e., the 30-million-word gap).

Although there has been debate over the size (Gilkerson et al., 2017) and nature of the word gap (Rothchild, 2016), the importance of parents’ input for the neurodevelopment of the brain (Kuhl, 2010) and children’s language learning cannot be denied (Golinkoff et al., 2018). The implications of Hart and Risley’s discovery are twofold: (a) that the identified precursor of the achievement gap begins earlier than previously thought and (b) that language intervention to prevent the word gap should start at birth. We also note that the birth-to-age-3 period remains a largely untapped window of opportunity for promoting early learning and advancing school readiness.

Sixteen million children in the United States (birth to 3 years of age) grow up in significant poverty (Child Trends, 2019; Council on Community Pediatrics, 2016; Kids Count Data Center, 2019), and most are African American and Hispanic Latinx (Child Trends, 2018). They are most at risk of experiencing the word gap and its deleterious effects regardless of their first language (Fernald et al., 2013; Hurtado et al., 2008). The long-term outcomes of not addressing this social precursor of the achievement gap are a life course of great individual- and population-level inequities for families living with limited resources, at vast cost to communities and the nation (Auguste et al., 2009; Golinkoff et al., 2018).

Children first learn language through the interactions they have with their parents/caregivers. The brain, unlike most organs, is unfinished at birth. Still waiting to develop

are the neural connections that support memory, behavior, movement, and language (Romeo et al., 2018). When a baby babbles and gestures or a toddler begins using words, and a caring adult responds contingently with eye contact, gestures, or words, neural connections and language are strengthened. Parents have the power to build their baby's brain and language when they understand and fulfill their important role in providing language experience through an evidence-based, interactional/transactional style (Warren, 2015). Interventions based on this style share two key principles of effective child language-learning interactions wherein (a) adults follow a child's lead and create joint attention and (b) recast child vocalization to enhance vocabulary and language complexity throughout the varied contexts and turns in the interaction (Hart & Risley, 1978; Warren, 2015). Following a child's lead has the effect of promoting child initiations with the adult, whereas adult recasting enables the child to follow up with additional conversational turns and responses. Together, this interaction style and its components are highly responsive, child engaging, and reinforcing.

Interventions at the Child/Family Level

This interaction style has been the focus of a number of interventions for enriching children's language-learning environment for use by parents in their homes (Carta, 2018; Heidlage et al., 2019), as well as a number of city (Wong et al., 2020) and community contexts such as well-child visits in primary care (Mendelsohn et al., 2011), home visiting (Buzhardt et al., 2018), childcare and early education (Walker et al., 2020), laundromats (Neuman et al., 2020), libraries (Beecher & Van Pay, 2020), grocery stores (Irvin et al., 2019), and so on.

Intervention programs that combine this interaction style with delivery methods (Biel et al., 2020; Ramirez et al., 2020) that include a progress-monitoring/feedback function to help adults improve their performance can be effectively taught by health care professionals and home visitors, serve as the vision and mission of community prevention programs, and can be disseminated widely in prevention information campaigns. A selection of English and Spanish child/family intervention programs that have reported forms of effectiveness include the following:

1. **Promoting Communication Tools for Advancing Language in Kids (PC-TALK):** PC-TALK (<https://talk.ku.edu/>) is a scalable program supporting parents' and caregivers' use of these language-promoting strategies within the daily routines of childcare and the home (Buzhardt et al., 2020, 2021; Walker et al., 2020). The strategies can be implemented by parents and early educators when taught to do so by home visitors, and/or childcare providers. The PC-TALK website contains a range of downloadable tips, videos, and resources, including progress-monitoring tools.
2. **Talk With Me Baby (TWMB):** TWMB (<https://www.talkwithmebaby.org/>) is a language-promotion program for health and community settings (Zauche et al., 2016, 2017). The program is delivered prenatally and later through well-child visits in pediatric primary care. In this program, health care providers use their time with parents/caregivers during the well-child visit to teach them how to use language-promoting interactions during their everyday activities with their children. TWMB

- consists of (a) educating parents/caregivers about the importance of the early language environment for a child's developing brain and future education/health outcomes, (b) modeling high-quality language interaction strategies, and (c) coaching parents/caregivers to engage in language-rich interactions with their child.
3. **Háblame Bebé (HB):** HB (<https://apps.apple.com/us/app/h%C3%A1blame-beb%C3%A9/id1349793334>) is a language-promoting smartphone application that encourages low-income Hispanic mothers to talk more to their children in their native Spanish with the goals of (a) improving their children's early language environment, (b) promoting bilingualism, and (c) monitoring developmental milestones (Baralt et al., 2020; Baralt & Darcy Mahoney, 2020; Larson et al., 2020).
 4. **The Family Read, Play, and Learn Spaces (FRPLS–Laundromat) Intervention:** The FRPLS–Laundromat Intervention is an intervention delivered in laundromats (<https://laundrycares.org/family-read-play-learn-space-kits/>) that uses families' visits to the laundromat as an opportunity to engage in language-rich activity (Neuman et al., 2020). FRPLS kits acquired through funds provided by the National Laundry Association create a language-learning center context in laundromats for parents and children to use while waiting for their wash. Materials and laundry aligned talking tips are included to build vocabulary.
 5. **Talk Around Town (TAT):** TAT is a smartphone application (<http://talkaroundtown.waypoint-platform.com/>) that automatically provides talking tips on topics and vocabulary aligned with places in the community in which the parent and child are located at any point in time. The app uses GPS to locate a parent and child in neighborhood locations that have been previously defined by the parent during program setup. The app prompts the parent to use vocabulary aligned with visiting the supermarket, park, and so on using the strategies described previously (Bigelow et al., 2020; Turcotte et al., 2017). TAT also provides some support for data collection and progress-monitoring feedback.
 6. **LENA Start and Grow:** LENA (Language Environment Analysis) programs are delivery systems that provide language-promoting strategies to children delivered by parents and/or early educators who are taught by trainers via weekly coaching sessions to help increase interactions, talk, and build children's language at home (LENA Start) and in childcare settings (LENA Grow; <https://www.lena.org/technology/>). LENA's programs provide a full set of resources and tools including talking tips and video-illustrated skills for interacting with children, including regular feedback on the amount of talk adults are providing children in their homes or classrooms using LENA's "talk pedometer" technology (LENA Research Foundation, n.d.; Greenwood et al., 2018). Their pedometer, inspired by Hart and Risley, is a wearable digital recorder that can record a day's worth of talk addressed to and heard by an infant/toddler. Extracted from the audio data and charted online are a number of key indicators of the child's language environment, including the number of conversational turns and adult word count. These data are used as feedback to parents and teachers working to improve their language input to children. The key difference between LENA Start and LENA Grow is that one digital recorder is used for an individual child at home (Start), whereas multiple children wear recorders in childcare settings (Grow). Monitoring multiple children

in childcare settings provides a more accurate picture of the classroom language environment, as well as the distribution of language input to individual children. Both systems include online project management and database-reporting systems in support of monitoring project progress and usability and scaling up individual users. Beecher and Van Pay (2020) reported a successful application of LENA Start delivered to parents in a library context, and Elmquist et al. (2020) reported preliminary findings from a community-based parenting program.

With our colleagues in the Bridging the Word Gap Research Network (BWGRN), an interdisciplinary network of 190 nationally recognized researchers, early childhood educators, health care practitioners, and policy makers (Carta et al., 2021), we are engaged in an effort to build out the capacity to use programs like these to prevent the word gap in communities. The aim is to help them create a community-wide initiative designed to deliver intervention programs to bridge the word gap and promote positive individual- and population-level outcomes.

Interventions at the Community Level

The multisector community partnership (Fawcett et al., 2010; Roussos & Fawcett, 2000) is an evidence-based approach to community development and improved population health. This intervention entails organizing a coalition with a mission to undertake collaborative actions around a highly valued community outcome (Watson-Thompson et al., 2013, 2018, 2020). The Community Tool Box model, developed and supported by our partner, the Center for Community Health and Development (CCHD) at the University of Kansas, is one widely used model for promoting this approach (<https://ctb.ku.edu/en>). The BWGRN has partnered with the CCHD to increase the number of children prior to kindergarten who are ready for school by preventing the word gap (Greenwood et al., 2017).

Using the Community Tool Box model, we developed the *Bridging the Word Gap Community Action Planning Guide* (BWG-CAPG; Greenwood et al., 2020a, b) and an aligned assessment of community progress in implementing the guide using CCHD's online BWG Community Check Box Evaluation System (Thompson et al., 2020). The BWG-CAPG provides a blueprint for conducting a BWG community initiative using evidence-based strategies and practices at multiple levels (community and child/family; Holt et al., 2013), and the BWG Check Box provides a means of tracking accomplishments for providing actionable feedback on progress and the need for celebration and/or the renewal of efforts (Fawcett et al., 2017; Watson-Thompson et al., 2013, 2018, 2020).

The BWG-CAPG combines applied behavior analysis (ABA) and community psychology in a public health framework (Biglan, 2018; Fawcett et al., 2016; Gottfredson et al., 2015; Greenwood et al., 2017; see Fig. 1). ABA contributes knowledge regarding effective child-level interventions, behavioral assessment, and intervention fidelity (Embry & Biglan, 2008). Community psychology contributes the multisectoral-partnership approach to community change (Biglan et al., 2017; Watson-Thompson et al., 2018). The public health framework uses a multilevel, multisectoral, combination-intervention design with the tools needed for delivery and replication in

other communities to achieve population-level outcomes following prevention science (Charlebois et al., 2012; Collie-Akers et al., 2013; Gottfredson et al., 2015; Spoth et al., 2011; Spoth & Greenberg, 2011). The *multiple levels* are child/family, community, and nation. The *sectors* are the functioning ecological units within a community (e.g., government, childcare, schools, pediatric health care, home visiting). A *combination intervention* is one wherein multiple interventions are simultaneously implemented within and across sectors and levels, taking advantage of the combinative effects of interventions, compared to a single intervention. Thus, anywhere a child is in a community, their language acquisition is supported.

The BWG community multisectoral partnership—a collaborating set of stakeholders within natural ecological sectors, each controlling relevant and unique assets and resources to which they can contribute to support BWG interventions spread throughout the community—is illustrated in Fig. 1. The BWG-CAPG (see Fig. 2) is composed of eight chapters detailing mission-critical topics and procedures for conducting an effective community intervention. Included topics range from an introduction to the word-gap problem (Chapter 1) to how to document progress and promote renewal (Chapter 8) needed to guide intervention decision making and to implement the plan successfully (see Table 1).

Our purpose is to report the results of a pilot investigation documenting the development and outcomes of the BWG-CAPG involving three community sectors in one metropolitan city assessed using the BWG Community Check Box. Our research questions were the following:

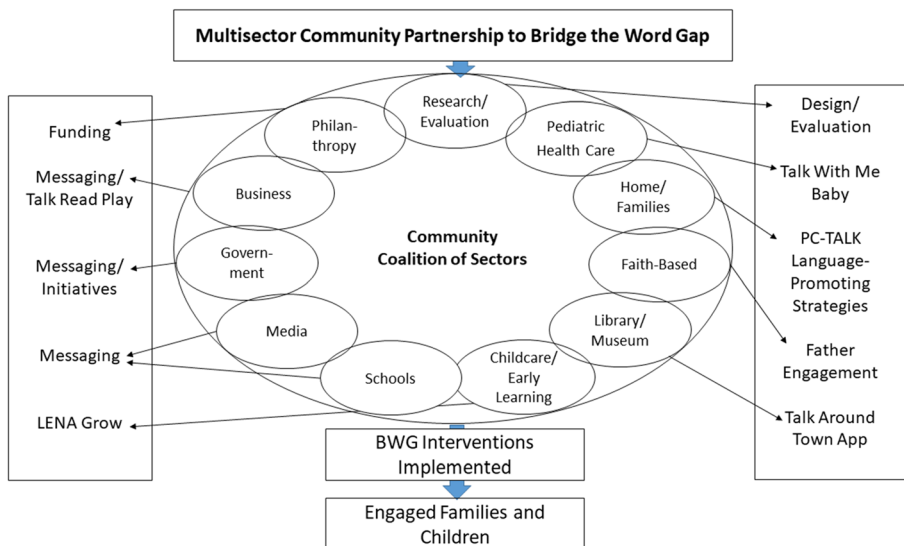


Fig. 1 Multisector Intervention to bridge the word gap—ensuring everywhere a child goes, their language will be nurtured. *Note.* BWG = Bridging the Word Gap; PC-TALK = Promoting Communication Tools for Advancing Language in Kids; LENA = Language Environment Analysis. Adapted from “Conceptualizing a Public Health Prevention Intervention for Bridging the 30 Million Word Gap,” by C. R. Greenwood, J. J. Carta, D. Walker, J. Watson-Thompson, J. Gilkerson, A. L. Larson, and A. Schnitz, 2017, *Clinical Child and Family Psychology Review*, 20(1), Figure 2 (<https://doi.org/10.1007/s10567-017-0223-8>)

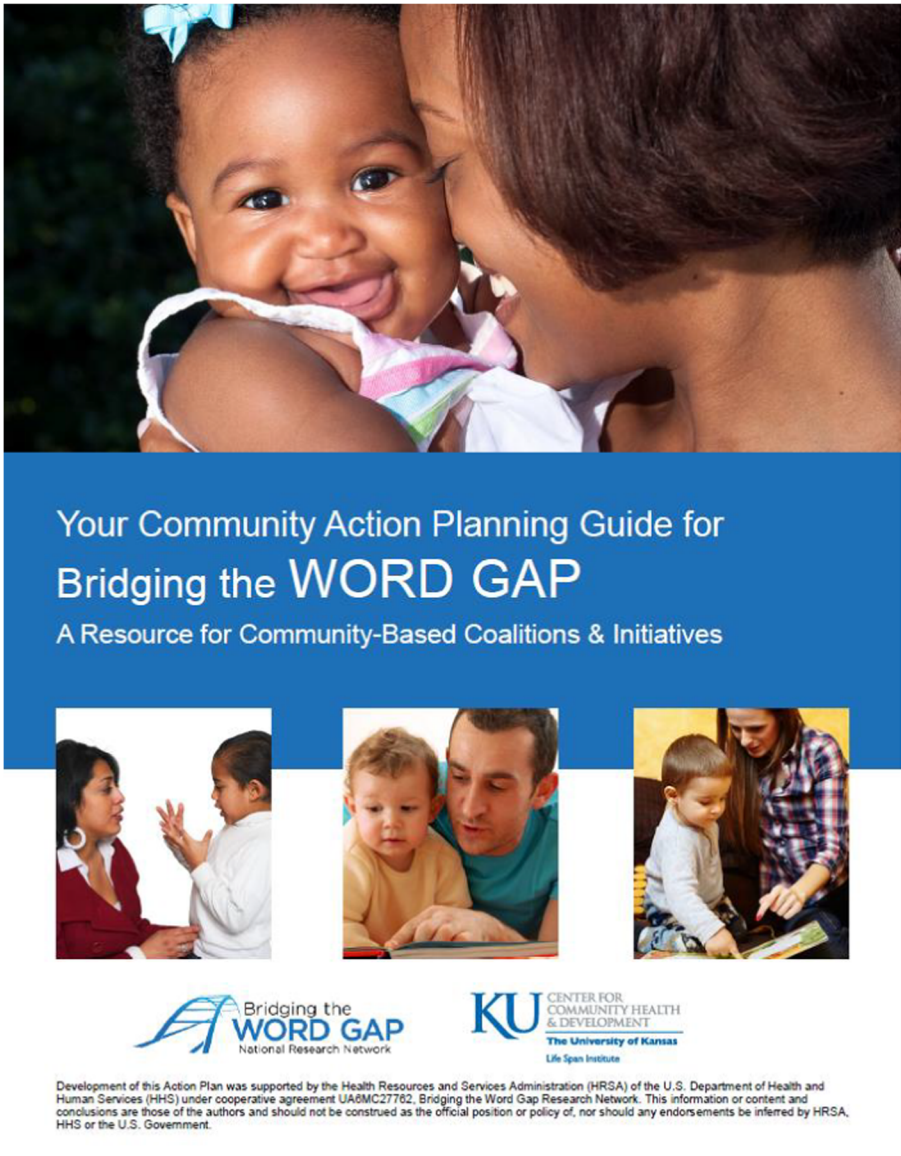


Fig. 2 Bridging the word gap community action planning guide

1. What capacity-building activities, products, and tools were outcomes in support of the BWG community initiative?
2. To what extent were the BWG initiative’s actions implemented?
3. What community changes occurred in practices, programs, and policies?

Table 1 Bridging the word gap community action planning guide *chapters and content description*

Chapter	Content description
1. Introduction to the Problem	The word gap and its negative consequences for children, families, and communities
2. Organizing Your Coalition and Gathering Information	Building a coalition to address local needs and risks and to achieve desired results
3. Overview of Strategic Planning	Developing vision, mission, objectives, strategies, and action plans
4. Working Together	Identifying partnerships and key sectors of the community to involve as partners
5. Preparing Your Action Plan	Identifying needed potential community and systems changes
6. Refining Your Action Plan	Building consensus on the proposed changes
7. Finalizing Your Action Plan	Identifying action steps to address each desired change in the final plan
8. Documenting Progress and Promoting Renewal	Collecting and using progress data to support making decisions for the allocation of efforts to renew and sustain the program going forward
Appendix A	Worksheet for action steps needed to make identified changes

Method

Design

Multilevel combination-intervention designs are commonly used in business, public health, and education to study influences and maximize outcomes in organizations that affect individuals who are part of these organizations (Charlebois et al., 2012; Peugh, 2010). Some multilevel examples include departments within companies, classrooms within schools, and families living in communities. The design is ecological and multivariate. In this case, we conducted a multilevel case study targeting change in three sectors of one community. Community-sector interventions served as Level 2 in the design; child/family interventions served as Level 1.

Participants

Participants included three community sectors (pediatric health care, childcare, and research and evaluation [R&E]), their existing professional staff/caregivers, and the community's children and families receiving their services. Pediatric health care participants were 12 pediatric nurses within a major city hospital who were taught to deliver TWMB education, modeling, and coaching during well-child visits. Documentation of these visits focused on the parents of 62 newborn infants during their well-child visits. Childcare participants included 14 teachers and 34 children from three infant/toddler centers who were taught to use the LENA Grow intervention. Children in childcare ranged in age from 14 to 20 months; one had a developmental disability and was receiving early intervention. For all children, English was the language spoken in the home. Three of the 14 teachers had completed their bachelor's degree, two had associate's degrees, and nine had finished high school or completed their GED. The

R&E team included the BWGRN developers and their CCHD partners: five PhD researchers, one program assistant, and two graduate research assistants.

Measures

The online Community Tool Box workstation was used to collaborate with partners, manage the project, document information about individual BWG accomplishments made by the three community sectors, and report results. The Community Check Box Evaluation System (Fawcett et al., 2017) was used for documentation and progress monitoring. We developed and tested a scoring taxonomy for classifying BWG accomplishments in the check box system and implemented it through the workstation. We used it for recording and scoring individual BWG actions implemented within each sector.

Each sector implemented its sector-specific set of action steps guided by Chapter 4, “Preparing Your Action Plan: Inventory of Potential Community and System Changes,” in the BWG-CAPG. Each documented accomplishment (action) counted as one raw data event in this electronic logbook. A 93-item survey was used to detail and classify each separate activity in the database. Analyses of these data enabled item summaries, cross-classifications (i.e., community changes by sector), and graphical/numerical reporting for review and interpretation. For example, we were able to document the number of meetings, their purpose, and the results of each. We documented R&E visits to participating organizations for the purposes of training, coaching, and feedback regarding the use of specific intervention strategies. We documented the community organizations and individuals participating in the effort according to date, topic, and type of event.

For this report, we coded individual accomplishments in terms of seven outcome categories of interest: community changes (i.e., new or modified BWG-related policies, programs, and practices in response to word-gap prevention), community actions (i.e., actions carried out to support community changes), services provided (i.e., delivery of BWG-related services, information, and training or other valued services, including individual-level supports), dissemination efforts (i.e., conveying the community’s BWG-related information about the word gap outside of the community), development activities (i.e., activities that increased the capacity of the BWG coalition to meet its goals), resources generated (i.e., BWG initiative funding acquired), and other (i.e., for which no code had been created, e.g., phone calls, internal meetings, meeting scheduling). All scores were in terms of frequency, cumulative frequencies (rate per month), and percentage of occurrence.

The scoring definitions were developed, tested for agreement, and finalized prior to the study. Preliminary scoring disagreements among R&E and CCHD partners were discussed relative to the written definitions and consensus agreement on definitions on the scoring established for each item. During the study, two CCHD staff independently reviewed and scored 23% of the documented BWG activities in the database for interobserver agreement. The two independent reviewers scored the accomplishments by type (i.e., community change) and behavior-change strategy it represented (i.e., modifying barriers). Interobserver agreement was calculated by dividing the number of agreements between the two independent scorers by the total number of documented

activities scored. The level of interobserver agreement was 98.4% for the type and 96.8% for the behavior-change strategy.

In this article, we have focused on the outcome of special interest: the number of community changes that occurred with the potential for preventing the word gap. The total number of community changes served as the denominator when calculating the percentage of changes by sector and partners.

Procedures

The investigation was conducted over a 21-month period just prior to the COVID-19 pandemic (July 2018 to March 2020). The near-final versions of the BWG-CAPG and online BWG Community Check Box were used. The R&E sector provided the training, coaching, and logistical support as described in what follows to the other two sectors based on the BWG-CAPG. The R&E team also provided the documentation services that were used in all three sectors using the BWG Community Check Box.

The pediatric health care sector (nurses at Children's Mercy Hospital, Kansas City) chose to use the TWMB intervention, which allows health care providers to (a) teach parents/caregivers about the importance of early language interactions with their child and (b) equip parents/caregivers with specific evidence-based skills to increase language interactions with their child through their daily activities in the home. Fourteen nurses learned how to implement TWMB during their well-child visits through group training that incorporated lecture, video examples, and role-playing. Key features of TWMB included (a) teaching parents about how talking with their baby is important for building their child's brain, (b) modeling language-promoting strategies (tuning in to the child, engaging in conversational turns, and narrating their daily activities), and (c) engaging parents in role-playing one of the strategies. While nurses implemented these strategies with all of their well-child patients, who included children between 2 months and 36 months of age, the effects of the strategies on parents'/caregivers' knowledge about language promotion and their use of the strategies were measured for a subset of 62 families who agreed to participate in the study. Following three well-child visits, these families responded to a survey about their knowledge of language promotion and their level of satisfaction with the language strategies. Significant improvements in parents'/caregivers' knowledge of language-promotion strategies were documented, as well as parents'/caregivers' agreement that the strategies were acceptable and easy to implement within their daily routines.

The childcare sector programs chose to use the LENA Grow intervention as part of their effort to improve the quality of childcare. The intervention enabled early educators to (a) learn about the importance of adult interactions in promoting children's language learning, (b) objectively monitor the occurrence of their own daily use of the language-promoting style via talk with children, (c) improve their talk and conversational turns based on the frequent automated LENA feedback in graphical form, and (d) receive coaching on the strategies.

Teachers met individually with coaches who were research assistants on the R&E team to learn the language-promoting strategies. Once per week, a sample of children wore the LENA devices that provided hourly data about conversational turns and the number of words children were hearing from adults in their classroom. Teachers received weekly reports on these indicators regarding the number of language

interactions in their classrooms from their coaches. After 3 weeks of baseline, in which teachers received graphical LENA data without coaching, coaches added specific training on techniques they could use during the course of the day to increase the number of interactions and conversational turns. Coaching on strategies continued for 13 weeks. LENA feedback with coaching led to increases in the number of conversational turns distributed to more children over baseline, and teachers reported high satisfaction with the coaching experience.

Statistical Analysis

Basic descriptive statistics (mean, standard deviation, and percentage), cross-tabulations, and graphical displays were used to address the research questions. These analytical tools were available in the BWG Community Check Box Evaluation System. Using the system, the database of documented accomplishments was classified, cross-classified, and graphically displayed. Progress reports were provided when needed for feedback on program rates of implementation and for summative analyses and reports.

Results

What Capacity Building Occurred to Support the BWG Community Initiative?

A number of products, tools, and resources were required to conduct the BWG community initiative as envisioned by Greenwood et al. (2017). We were able to document the number of capacity-building actions that occurred, including work with language interventions (159), BWGRN and CCHD collaborative events (25), BWG-CAPG development activities (4), BWG Check Box development activities (8), and other activities (1). These actions, in terms of meetings, data collection, trainings, technical assistance, and presentations, in rank order of occurrence, were behind the creation of the products used in this study.

To What Extent Was the BWG Initiative Implemented?

Over the course of the project, 282 individual accomplishments were documented (Table 2). A plot of the cumulative number of monthly accomplishments made by sectors is shown in Fig. 3. Total accomplishments by the end of the project in health care were 134, in R&E were 128, and in childcare were 109. Because 89 of these were documented as joint accomplishments by two or more sectors, the total was 371. Monthly implementation was slow during the first 4 months (Fig. 3), then began positive acceleration thereafter over the next 9 months in each sector. Implementation proceeded as childcare accelerated ahead of health care and R&E in accomplishments through August 20, 2019. Thereafter, health care and R&E rates of accomplishments increased, closing in and surpassing childcare through the end of the project. The distribution of these 282 individual accomplishments when classified by the type they represented were as follows: 195 for development (69%), 66 for services provided (23%), 11 for community actions (4%), and 11 for community changes (4%), whereas dissemination, resources generated, and other activities were all 0 (see Table 2).

Table 2 Frequency of community activities by type during reporting period

Activity type	Examples of BWG supports provided	# of activities
Community changes	New agreement to implement a program in an organization (policy), different hours of service (practice)	11 (4%)
Community actions	Meetings to support development of community changes related to mission and objectives	11 (4%)
Services provided	Classes, trainings, communications, presentations	65 (22%)
Dissemination efforts	Publication, dissemination of BWG briefs (policy, research)	0 (0%)
Development activities	Work on developing assessment, strategy plans, evaluation reports, sustainability plan	195 (69%)
Resources generated	Materials, donated time by individuals, funding received	0 (0%)
Other	Internal meetings, phone calls, scheduling meetings	0 (0%)
Total		282 (100%)

Note. BWG Bridging the Word Gap

A plot of the cumulative number of participants targeted and reached over the months of the project reflects the multilevel cascading effects of the BWG-CAPG implementation over time (see Fig. 4). First to be reached by the rollout of the project were organizations, followed later by nonparental adults (nurses, teachers), parents/

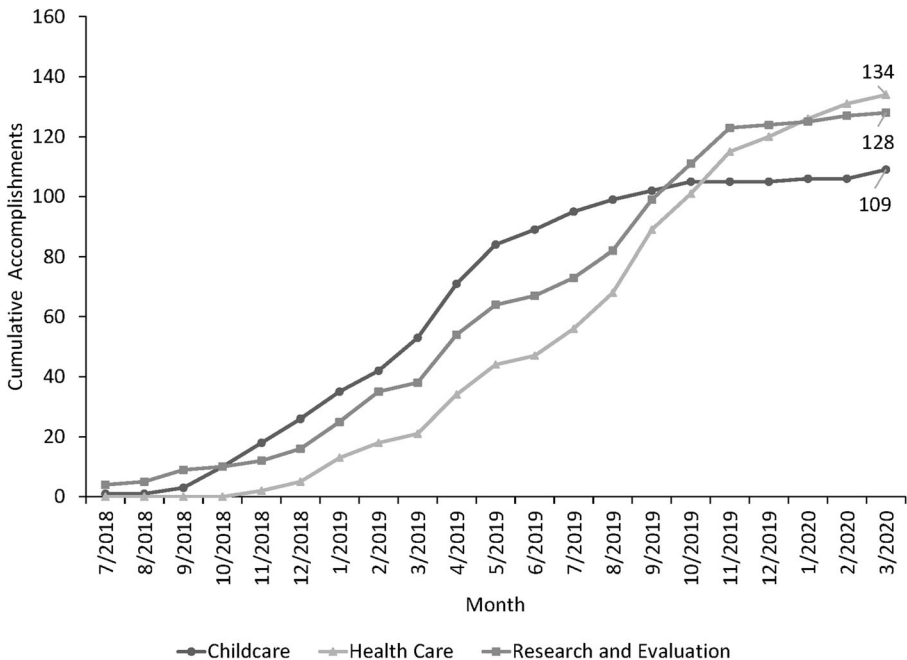


Fig. 3 Cumulative monthly accomplishments by sectors

guardians, and the community over time. These changes were indicative of the multilevel, ecological effects as the intervention expanded over time.

What Changes Occurred in Practices, Programs, and Policies due to the BWG Initiative?

Community changes ($N = 11$) were made in the health care (24%), R&E (35%), and childcare (41%) sectors (see Fig. 5). An example of a change achieved in health care was an agreement between the BWGRN and Children’s Mercy Hospital to plan and implement the TWMB intervention with the nursing staff in one of their pediatric care units and all their parents receiving well-child visits. For R&E, an agreement was reached between the BWGRN and the CCHD to build an online workstation and Community Checkbox system for specific use with the BWG-CAPG community project. This included space and colocation of a CCHD workgroup at the Juniper Gardens Children’s Project to collaborate with the BWGRN team on this work. For childcare, an agreement was reached between the BWGRN and the Family Conservancy’s funded Start Young Project to provide professional development to local childcare programs so they could use the LENA Grow intervention.

The community organizations responsible for these changes are shown in Fig. 6 and included the Family Conservancy, at 35%, and the Children’s Campus of Kansas City, the school district, Project Eagle Community Programs, and others at 6% each. These BWG changes were achieved by providing information and enhancing skills (55%), enhancing services (27%), and modifying policies and systems (18%). An example of providing information was a documented community conversation featuring the documentary *No Small Matter* (<https://www.nosmallmatter.com/>) and a discussion that followed regarding the importance of preventing the word gap to promote school readiness and building opportunities for this effort to take place in the county.

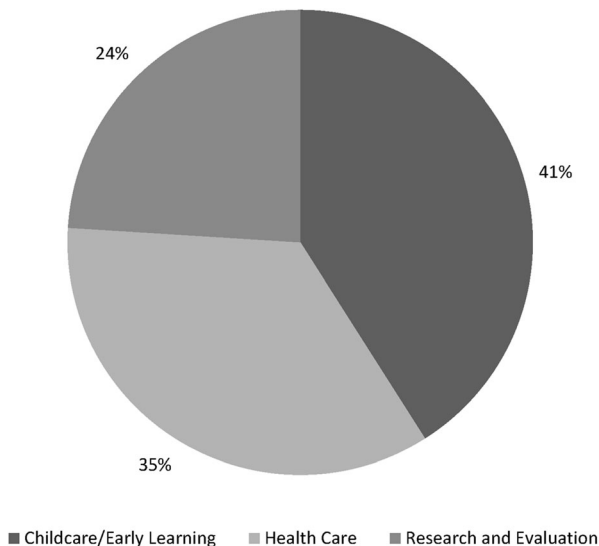


Fig. 4 Percentage of community changes by sector

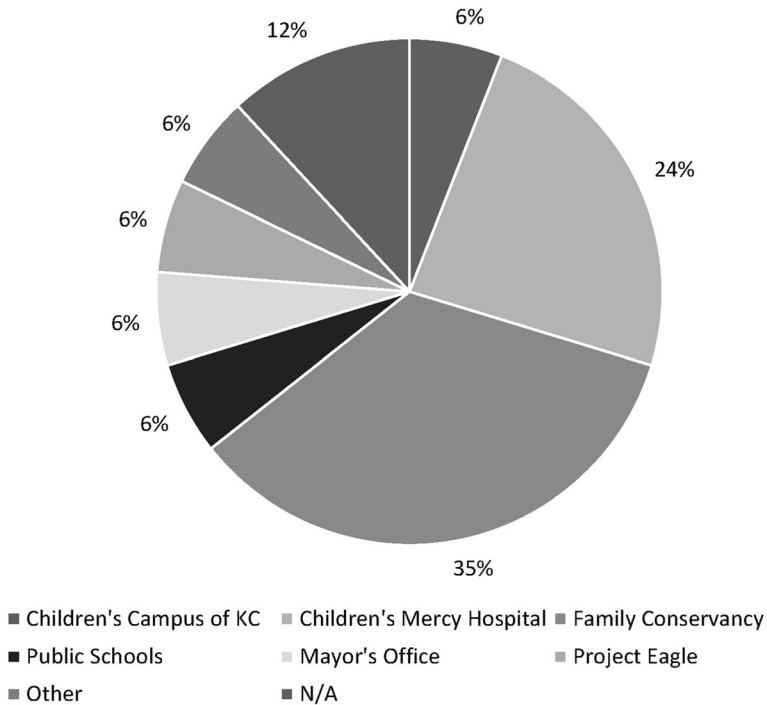


Fig. 5 Percentage of community changes by partnering community organizations

Another example included sharing the BWG-CAPG with community leaders and discussing its contents and uses. Examples of enhancing services were documented meetings with different childcare center directors leading to the provision of training and LENA Grow services to children. Another example included new language nutrition-coaching sessions conducted by several nurse practitioners with patients during their well-child visits. An example of a modified policy was a change made to the hospital's pediatric patient electronic medical records to indicate when the TWMB intervention was implemented during a well-child visit. Although only three sectors were intensively targeted for change in this project, at least one documented accomplishment was obtained that involved seven community sectors not targeted in this pilot study. These were businesses, faith-based organizations, government, libraries and museums, the media, philanthropy, and the school district Fig. 1.

Discussion

Disparities in the early language environment disproportionately affect children growing up in poverty. Evidence has shown that the early language environment is a critical social determinant and a stronger predictor of children's long-term academic success and health outcomes than parents' income, level of education, and ethnicity (Dickinson & Porche, 2011). The prevalence of children in poverty and their high risk of language delays suggest a crisis, as do current concerns regarding reducing inequities in the lives

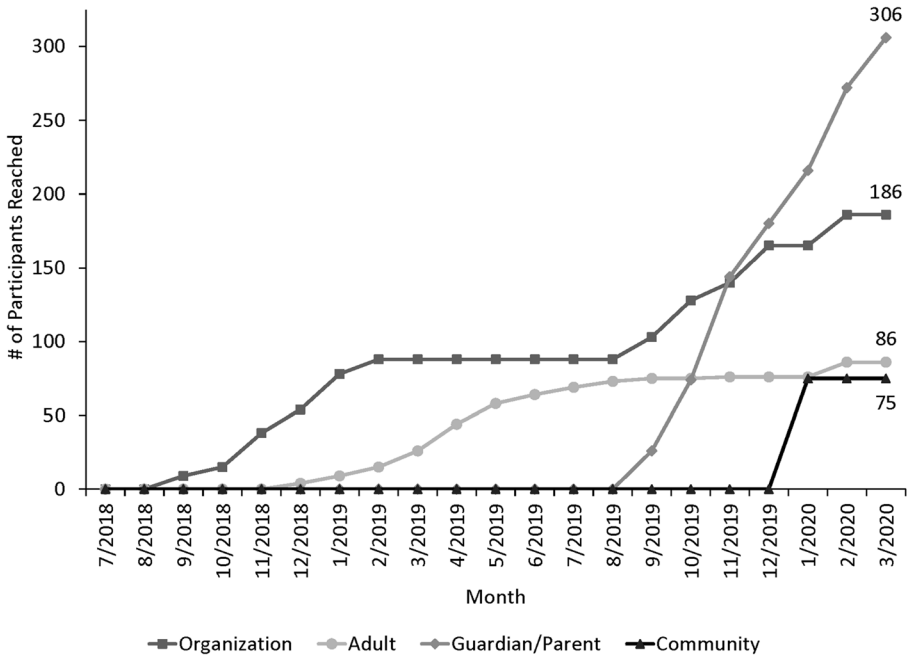


Fig. 6 Cumulative number of target participants reached

of vulnerable populations, which can be avoided if acted upon (Biglan et al., 2017, 2020). Therefore, enriching the home language environment of children from low socioeconomic backgrounds stands as an important point of leverage for shifting the adverse effects of poverty beginning in the first few months of life.

The last 2 decades have produced clear evidence that language-promotion strategies deployed in home and childcare settings can optimize caregiver–child language interactions. Yet existing evidence-based interventions have not yet had the reach needed to narrow population-level language-learning disparities (Greenwood et al., 2020a, b).

The purpose of this article was to describe the initial development of a multisectoral community-wide prevention/intervention approach to affect population-level outcomes and report the results of a small-scale pilot investigation. The BWG-CAPG is a multilevel, multisectoral, combination-intervention program involving strategies for up to 10 sectors in a community. In this pilot, we demonstrated the use of the guide in three sectors in one metropolitan city and documented implementation using the BWG Community Check Box. Pilot results were promising in regard to the increased capacity to intervene and facilitate community engagement and accomplishments over a 21-week period. This experience served as a useful basis for continuing work on the BWG components (BWG-CAPG, BWG Check Box), which are now ready for community testing, evaluation, and improvement as envisioned (Greenwood et al., 2017).

This work and its findings are significant to the field as a basis not only for enhancing the language environment of individual children and their parents/caregivers but also for scaling up and out interventions to include all children and families in a community to achieve wide-scale implementation and population-level child language outcomes. The approach does not call for creating new social programs

to bridge the word gap, but rather for creating local community coalitions of collaborating partners—stakeholders with a vision and mission of obtaining the valued and desired outcome of better prepared children, who ultimately will become contributors to the economic, health, and social well-being of the entire community.

Limitations and Future Research

This work was a small-scale pilot study covering only a portion of the sectors, procedures, and methods contained in the BWG-CAPG intervention, which we evaluated using an early version of the BWG Community Check Box. Further work with these tools is in progress toward the testing and evaluation of the entire community intervention. We also note that only community-level implementation data were presented. No child-level outcomes were reported. Because of the descriptive design of the evaluation, we could not make any causal conclusions. However, we were able to conclude that the actions and community changes that occurred coincided only with measured changes in activities consistent with those established for the sectors targeted for intervention versus those not targeted. Results were also consistent with a theory of change in which an increased capacity in the form of newly developed tools coincided with changes in actions leading to modified or new practices, programs, and policies.

This finding suggests the future value of using single-case designs in community research—for example, the multiple-baseline design across sectors within a community or a multielement design with sectors randomly selected and counterbalanced enabling comparisons and the manipulation of treatment by sectors (Biglan et al., 2000; Kennedy, 2005). Full-model BWG-CAPG evaluations in multiple communities are needed to demonstrate feasibility, implementation, sustainability, and outcomes at both the community and child/family levels of analysis (Gottfredson et al., 2015). Longitudinal evaluations are especially needed to examine distal prevention effects indicated by improvements in publicly available community population indicators (i.e., percentage of children ready for school, reading proficiency, dropout rate, graduation rate, etc.).

A challenge to this work is the prevailing view that the randomized controlled trial is needed to evaluate multilevel community-based interventions. Multilevel community interventions are difficult and costly. Just a few of the difficulties in relying on this gold standard are (a) the requirement of a priori assignment to cluster-randomized groups, (b) power requirements at the community level that drive inferential statistics, (c) the expense and impracticality of enrolling large numbers of communities that are willing to chance randomization to potentially less efficacious treatments, and (d) the requirement that all communities be ready to start with pretesting and intervention simultaneously (Biglan et al., 2000). Single-case designs offer rigorous alternative methods at a reasonable cost (Charlebois et al., 2012; Congdon et al., 2020).

Conclusion

This limited evaluation of the BWG-CAPG intervention produced results strong enough to support further research and development. Given the prevalence of young children experiencing the stresses of poverty and the recent identification of this alterable social determinant, the potential for the success of new programs like the

BWG-CAPG in building equity in early language learning seems to be of high value and worth the investment. For the field of ABA, with its contributions of the principles of behavior, evidenced-based interventions, single-case designs, behavioral assessment, and community-engaged research, this work illustrates community-level extensions with the potential for preventing the word gap and broadly promoting healthy child development and school readiness at population levels.

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Declarations

Conflicts of interest We note no conflicts of interest.

Ethical approval The work had institutional review board approval at the University of Kansas.

Consent to participate Participants were volunteers and provided consent.

Consent for publication All authors consented to publication.

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