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Building the Iowa Data Drive: a participatory approach to developing early childhood indicators for state and local policymaking

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Abstract

Introduction

Public service leaders face increasing challenges using data effectively due to program silos, limited resources, and the increasing complexity of data. To address these challenges, Iowa's Integrated Data System for Decision-Making (I2D2) partnered with state and local leaders in early childhood to curate key indicators and develop population-level data tools and training to promote policy and practice improvements.

Methods

We relied on a mixed-methods, participatory approach to understand early childhood data and reporting requirements and how state and local leaders leverage data to meet these requirements and inform decisions. We conducted a Data Landscape Overview consisting of interviews, surveys, document review, and meetings with state and local leaders. Public deliberation facilitated iterative feedback and collective decision-making through stakeholder discussions.

Results

Our participatory approach resulted in three actions to improve data collection and use within Iowa's early childhood system: curating a set of early childhood indicators; developing training and strategic planning tools for effective data use; and building the Iowa Data Drive (IDD), an interactive data portal for accessing key early childhood indicators and population-level insights.

Conclusions

A robust IDS can promote systems change when grounded in strong partnerships, phased implementation, and a commitment to clear communication. By centering local voices and fostering trust, we developed indicators and tools that support data-informed decisions and improved services for young children and their families.

Keywords

participatory action research; early childhood; public deliberation; community partnership; data capacity building

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Introduction

Public service leaders across the globe face increasing accountability directives to demonstrate program effectiveness and secure consistent funding. Program silos and complex layers of requirements at multiple levels of government (e.g., federal, state, local) further complicate this responsibility. While there is now an array of indicators and other data tools publicly available to inform decision-making, sorting through these resources to strategically identify which ones are most relevant, accurate, and reliable is a daunting task. Such efforts require specialised knowledge and ample time—two assets not often readily available in public service settings where urgent problems take precedence and staffing shortages are common [1]. This problem has only increased as the scope of big data, AI, and other emerging technologies continues to grow and government agencies struggle to maintain a steady flow of reliable data that is appropriate for informed decision-making [2, 3].

In recognition of the challenges, the United States (U.S.) federal government passed the Foundations for Evidence-Based Policymaking Act in 2018 in an attempt to prioritise data access, transparency, and use across siloed systems. Notably, this legislation called for federal agencies to strengthen interagency coordination, create clear processes for collecting and using administrative records including data sharing across agencies, and establish strategic plans that articulate evidence building agendas [4]. This bipartisan piece of federal legislation created the potential for public service leaders to come together across political lines to harness data more effectively in government programs. Meanwhile, the growth of Integrated Data Systems (IDS) in the U.S. and internationally has helped public systems address fragmentation and leverage data to create more holistic understanding of the children and families they serve. For instance, IDS data from the city of Philadelphia was used to prioritise access to a limited number of new universal pre-school slots based on neighborhood-level exposure to early childhood risks (e.g., low birth weight, maltreatment) and existing access to high-quality pre-school programs [5]. This is a prime example of the ways in which well-curated indicators and data systems not only support efficient use of public resources but also deliver tangible benefits to children and families.

In Iowa, we have built on this approach to create Iowa's Integrated Data System for Decision-Making (I2D2), where we equip state and local leaders with tools that streamline disparate data sources and requirements to more efficiently meet growing demands and make data-informed decisions. I2D2 was developed with a clear mission to identify and address the needs of Iowa's young children and their families using actionable insights from our IDS. We are guided by a set of co-created values to “act first and foremost in the service of improved public good and services” and “engage the community of practitioners, policymakers and researchers in the production and sharing of information generated from the inquiry process” [6, para.3]. We reviewed examples of IDS from across the United States (U.S.) to inform our development and continue to draw on best practices and established frameworks for governance, legal, technical, and other key components of high-quality IDS from international efforts [7]. We have

relied on participatory methods to advance our IDS over time because we know that merely building an index, indicator, or data tool—no matter how rigorously designed—does not mean it will be useful for the intended audience. Instead, we start with what our public service leaders need to do their jobs and improve decision-making and build flexible tools to meet those needs.

This paper describes our mixed-methods, participatory approach to curating a set of early childhood indicators for the State of Iowa and empowering local leaders with tools and training to use these data to improve policy and practice in their communities. We start with background about the challenges in aligning early childhood programs in the U.S. and Iowa's unique approach to serving early childhood needs, including the role of I2D2. We then outline our use of a participatory action research framework to conduct a data landscape overview and facilitate public deliberation events that helped us understand data needs and determine how to use our integrated data to foster collaboration across early childhood partners. This approach allowed us to balance academic, government, and community expertise, with academic partners guiding methods and state and local partners shaping responses to the data based on community needs. Our findings led us to three key actions described in the Results, one of which is the construction of the Iowa Data Drive (IDD), an interactive online portal where public service leaders and community members can view, analyse, and download key indicators to support early childhood strategic planning and advocacy.

Alignment challenges in the U.S. early childhood ecosystem

The U.S. has a constellation of public, private, and nonprofit partners that support the country's health and human service needs. Federal programs set national priorities and program rules and provide funding for states and localities to administer them. Despite shared objectives across federal agencies to support health and wellbeing, these federal programs often operate in silos with unique goals and accountability standards, leading to challenges in program implementation and outcome monitoring. Disparate federal systems trickle down to states and localities, leading to conflicting guidance, duplicative work, and difficulty aligning program efforts [8]. Within this context, it can be challenging for states and localities to collaborate effectively and serve the needs of their communities [6]. In early childhood, for example, differences between two major federal funding programs, the Child Care & Development Block Grant (CCDBG) and Head Start, create disjointed experiences; CCDBG allows states significant flexibility in setting quality standards for child care settings, whereas Head Start has uniform requirements (i.e., Head Start Program Performance Standards). For the majority of programs that rely on both funding sources, this complicates service delivery and creates administrative burden in documenting how programs are meeting standards and reporting outcomes [9].

Similar challenges exist with service sectors relying on blended funding streams from federal and state sources, including home visiting and maternal and child health.

Community-based organisations operating multiple early childhood programs simultaneously to support sustainable business operations face significant administrative challenges related to misaligned reporting timelines and requirements for fiscal accountability between the multiple funding streams and oversight agency requirements. Sometimes these reports may ask for the same information conceptually but use different definitions or reporting tools. This opens the door to confusion, data integrity issues, and extra work for programs that are already burdened and often understaffed. What this means for children and families in these systems is that program leadership is often tasked with many hours of data-related paperwork just to maintain funding. Further, this data work takes time away from direct services and is often not meaningfully connected to practice, making these systems less efficient and less able to meet children's needs.

Background on Iowa's approach to early childhood

Early Childhood Iowa provides statewide leadership & coordination

For over three decades Iowa has invested in coordinated early childhood services. Early Childhood Iowa (ECI), a legislatively established alliance of cross-sector stakeholders, leads this work with over \$26 million in state funds to support local innovations through public-private partnerships among state agencies and local program providers [10]. Directed by a State Board comprised of governor-appointed citizens and Department Directors (i.e., Education, Health and Human Services, Human Rights, Workforce Development, and Economic Development), ECI is charged with being the only *systemic* voice to promote early childhood wellbeing across domains. Under ECI's purview, Local Area Boards bring together leaders from the public, business, faith communities, and families to consider community needs, support program collaboration, and fill gaps. Using local needs assessments conducted every three years, these Boards award funds for local agency support services and track progress toward improving key outcomes for each geographic region within Iowa. The final component of ECI is workgroups comprised of cross-system stakeholders that tackle key issues. For example, the Results Accountability Workgroup is specifically tasked with informing accountability standards and prioritising performance indicators for ECI's annual reporting. Over time, this workgroup has been critical to narrowing in on early childhood indicators that are most relevant to track in Iowa and getting approval for their use by ECI's State Board.

I2D2 provides integrated data for key priorities

In 2019, ECI capitalised on an emerging partnership with Iowa State University (ISU) to build I2D2, an IDS that would support a data-driven approach to evaluation and continuous quality improvement of early childhood programs [11]. The first major project using I2D2 involved a statewide needs assessment to study populations of children entering kindergarten and their early childhood experiences from birth to school entry. This effort reflected a legislative priority for increased collaboration among state and local

early childhood partners. Our I2D2 team at ISU led this work by integrating data to document for the first time, unduplicated counts of children across programs and understand gaps in service usage, the early care workforce, and partner communication channels [9]. We also gathered collective input from nearly 2,000 stakeholders—including families, community members, executive leaders, private business partners, program managers, and providers—through 15 interdepartmental meetings, workgroup sessions, and statewide webinars. Learnings were incorporated into strategic planning sessions where stakeholders discussed how they might use data to refine elements of the current strategic plan and develop new goals and approaches directly related to the findings. A cyclical process of system learning and feedback was used to keep everyone informed of the goals, guide data collection decisions, build infrastructure (e.g., agency datasets and integration protocols), and refine key results.

While the statewide needs assessment produced valuable data for understanding broad patterns in early childhood, ECI Local Area Directors wanted more actionable insights to address community-specific challenges. They shared their frustrations with current data requirements that were time consuming and not well connected with the direct programming decisions they needed to make on a regular basis. The needs assessment process also became a catalyst for us to learn more about the specific needs of Iowa's local early childhood leaders for user-friendly tools and training to enable effective data use in their communities. This process of engagement, learning, and development will be further described in the following sections outlining our participatory research approach to the development of IDD.

Methods

Our approach to developing and refining key indicators leveraged ECI's statewide needs assessment process to better understand early childhood program requirements for fiscal accountability and outcome reporting. We also learned how Iowa's state and local leaders select data to meet their needs and inform decisions. Our aim was to use this information to improve data accessibility by building interactive data visualisation tools that promote collaborative decision-making across Iowa's early childhood system. We asked three key research questions to address this aim:

1. What are the data and reporting requirements for early childhood programs at the federal, state, and local level?
2. How do state and local leaders decide which data sources and indicators to use for reporting requirements and other needs?
3. What data sources and tool functionalities are most useful for decision-making and engaging in community discussions?

We employed Participatory Action Research (PAR) as the overarching framework for our methods. We applied the core components of PAR to conduct a Data Landscape Overview (consisting of iterative surveys and document analysis) and facilitate public deliberation (formal and informal collective decision-making events). This process began in 2019, and it is

ongoing today, as our approach emphasises iterative feedback to inform system improvement.

Participatory action research

PAR is a collaborative research approach that aims to create transformative change through systematic inquiry centering the experiential knowledge of those affected by a particular issue [12]. In our case, we center the perspective of state and local leaders in Iowa's early childhood system and let their insights drive the action taken in response to research. This approach was intentionally built into I2D2's governance documents and serves as the foundation for all projects [13]. PAR methods include six core components that we drew upon to address our research questions: "building relationships; establishing working practices; establishing a common understanding of the issue; observing, gathering and generating materials; collaborative analysis; and planning and taking action" [11, p.5]. Because these components are interconnected, actions focusing on one often touch on multiple components within the PAR framework.

We *built strong relationships* by partnering with ECI in their statewide needs assessment process, providing valuable data from I2D2 to support ECI's goals, and regularly attending ECI meetings. Our ISU team at I2D2 became deeply engaged in two meeting forums in particular—monthly Local Area Director meetings (designed to share local program coordination efforts and discuss population needs to drive responsive service approaches) and the Results Accountability Workgroup (subgroup of ECI stakeholders from health, education, child welfare, and other sectors who provide recommendations about performance measures and annual reporting to showcase ECI impacts). Being an invited partner in these meetings allowed the I2D2 team to become an integral part of ECI's strategic planning efforts and *establish common working practices* that informed the current project. In addition, these meetings helped us *establish a common understanding* of the data issues because we often discussed state and local leaders' challenges in identifying, understanding, and using data. To deepen our understanding, we conducted virtual structured interviews with 8 ECI Area Directors, who described in more detail their processes for collecting and using data for needs assessments and strategic planning and challenges they faced finding and making meaning from relevant publicly available data (See Supplementary Appendix 1 for interview protocol). We then discussed results with the larger group to engage in *collaborative analysis* and validate results. This ultimately revealed the need for a more comprehensive Data Landscape Overview to understand the full depth of data sources, definitions, and use cases challenging our local area leaders. As described in the following section, this was where we *gathered and generated materials* about fiscal and accountability reporting requirements (i.e., legislatively required reports about how funds are spent and what outcomes they have impacted or informal guidance documents often generated ad-hoc by individuals to facilitate reporting about expenditures, outputs, and outcomes). Lastly, when it came time to *plan and take action*, we used insights generated from our participatory processes to make recommendations to ECI leaders and its State Board. These recommendations translated into actions

ranging from revisions of guidance documents to legislative changes in Iowa legal code.

Data landscape overview

We conducted a Data Landscape Overview [14] to better understand fiscal accountability and outcomes reporting requirements and which data and tools were currently being used to meet them. This process included active engagement with state and local leaders during already scheduled in-person and virtual meetings (e.g., monthly Head Start director meetings, quarterly ECI workgroups, annual training for prevention program coordinators) using Mentimeter and Qualtrics surveys to gather input and feedback, and an extensive review and analysis of formal and informal documents on data access, use, and reporting (see Supplementary Appendix 2 for a sample of survey questions from this process).

After generating an inventory of known data sources through document and survey reviews, we began our analysis by reviewing reporting requirements. We created a list of federal, state, and local reporting requirements for each early childhood program along with the data collection methods state and local leaders were using (e.g., Head Start programs relied on the Head Start Community Assessment Matrix to evaluate and report their community needs) [15]. We then grouped reporting requirements by common concepts (e.g., poverty, maternal characteristics, health and social needs) and mapped reporting requirements to definitions. Next, we identified which data sources were most commonly used for what purposes. We researched each data source and documented information about quality, generalisability for population level estimates, and level of aggregation available. This resulted in a summary of pros and cons for each data source.

We cross-checked results for the Data Landscape Overview by triangulating data from surveys, interviews, and documents, and used these findings to then develop recommendations. As an example, ECI Area Directors are required to report and monitor progress across five legislatively mandated results areas for counties they serve (see Exhibit A). Directors reported in surveys and interviews that they were mainly using national datasets from Kids Count and the Census Bureau to ascertain these numbers even though state-held data sources were highly recommended for data quality and scientific rigor. Directors reported that even if they were aware of additional/better sources, they found it difficult to work with available state-level data and disaggregate it for local needs. This was an important insight into the reality of how data sources are selected and applied in practical settings. The Data Landscape Overview revealed key barriers to improving data quality that then informed our recommendations for improving tools and processes to support local use of data for decision-making.

Public deliberation

Our public deliberation process facilitated collective decision-making about which actions to take. As a method, public deliberation engages participants in discussions that consider diverse perspectives to reach collective, well-reasoned

recommendations reflecting multiple viewpoints [16]. In our case this included both formal and informal discussions. More informal public deliberation took place during routine meetings with stakeholders, such as monthly Local Area Director meetings and the Results Accountability Workgroup (as described above, this is a subgroup of ECI stakeholders who provide recommendations about performance measures and annual reporting). As components of the Data Landscape Overview were completed, we used these discussion groups to check for agreement (or disagreement) with what we learned and generate new questions for the ongoing Data Landscape Overview or recommendations for action. To illustrate what this looked like in practice: one task of the Results Accountability workgroup is to recommend indicators and data sources for the ECI State Board to track performance of services funded by ECI legislation and child outcomes they intend to influence. This workgroup made a formal recommendation to the Board to adopt a revised set of indicators that included dropping those not frequently used in local strategic planning (e.g., infant mortality), and adding updated data sources that our deliberation process suggested better represented the conceptual needs of the group.

Through both the Data Landscape Overview process and these smaller public deliberation events, it became clear that state and local leaders needed a single place where they could routinely access early childhood data to meet reporting and strategic planning needs. Therefore, in April 2021 we held a more formal public deliberation event with ECI Local Area Directors to develop ideas (see Exhibit B for discussion questions). This event was virtually attended by approximately 25 participants representing different geographic areas of the state and sizes of communities. We recorded responses to the discussion questions, then grouped them by emergent themes to develop a concise summary of key points (shown in Exhibit B). The discussion helped shape our plans for the development of an interactive data tool, as described further in Results. Within our participatory framework, public deliberation allowed us to balance insights from academic and government partners with community expertise, ensuring that all voices were appropriately weighted throughout the process. This approach empowered the group to collectively determine the best strategies for action, with academic partners guiding methodological choices and the state and local partners providing critical input on community needs and solutions.

Results

By conducting the Data Landscape Overview and hosting public deliberation events within a participatory research framework, we gained valuable insights to address our three research questions and pursue three actions towards improving data collection and use within Iowa's early childhood system. These actions included 1) creating a streamlined set of early childhood indicators that would meet the needs of multiple users across the State of Iowa, 2) developing training and strategic planning tools for state and local leaders to improve capacity for effective data use, and 3) building an interactive ECI data portal, which is now known as the IDD.

Key findings from the data landscape overview and public deliberation

The first set of findings highlighted different purposes for collecting indicators across federal, state, and local levels. Federal reporting requirements mostly center on high-level performance metrics and documentation of population needs to secure federal funds and track their spending. State-specific requirements often stem from these federal mandates but also include measures related to state investments of resources and/or legislative action. For instance, ECI was established in response to a federal initiative to strengthen partnerships between Head Start and other early childhood programs. So, the relevant indicators identified at that time focused on Iowa's prioritised results areas (i.e., healthy children, children ready to succeed in school, safe and supportive communities, secure and nurturing families, and secure and nurturing early learning environments) [17] while also meeting Head Start Performance Standards at the federal level.

Compared to state and federal accountability purposes, local needs for data more often focus on indicators to drive early childhood programming needs based on community characteristics. Ultimately, data collection to meet any of the local, state, *and* federal reporting requirements originates at the local level and flows upward from there to higher branches of government. This means local leaders bear much of the administrative burden of data collection, while simultaneously managing a wide range of other responsibilities (e.g., contract fiscal management, quality improvement). Where reporting requirements are inconsistent or partially duplicative, the quality of local data collection efforts may suffer. For example, as shown in Exhibit A, federal Head Start Performance Standards require data on teen pregnancy rates that emphasises tracking the mother (i.e., % of all teens who give birth), while ECI focuses on the impact on young children of having a teen mother and therefore tracks child births to women under age 20 (i.e., % of all births that are to a teenager). Although these measures seem similar, they are not interchangeable and carry different implications for social service planning. Therefore, when local programs are expected to collect both metrics, making meaning from them to drive strategic planning becomes a challenge.

Exhibit A: sample data inventory of state and local reporting requirements for early childhood in Iowa

We grouped three early childhood program reporting requirements (Early Childhood Iowa; Maternal, Infant, and Early Childhood Home Visiting (MIECHV); and Head Start) based on common themes. Using socioeconomic and birth/maternal characteristics as examples shows the nuances in reporting requirements that often make it difficult for programs to select and use consistent indicators.

Program	Early childhood Iowa (ECI)	Maternal, infant, and Early childhood home visiting (MIECHV)	Head start
Mandate	State mandated metrics with prescribed definitions [18]	Federally mandated metrics with prescribed definitions [19]	Federal guidelines with categories containing flexible metrics within required performance standards [15]
Socioeconomic characteristics			
Poverty	% of children under age 6 living in poverty	-	Number of children living below poverty level
Workforce & education	% of children under age 6 with all parents in the workforce	Primary caregiver education	Economic activities (e.g., median income level, employment)
Unemployment	Unemployment rate	-	-
Birth/maternal characteristics			
Teen mother	Percent of all births that were to a mother under age 20	-	Percent of all teenagers who gave birth
Premature birth	-	Premature birth	-
Low birth weight	Low birth weight	-	Low birth weight
Infant mortality	Infant mortality rate	-	Infant/child death rates
Substance use	-	Primary caregivers who are screened for both unhealthy alcohol use and drug use (optional)	Number of children born to mothers using substances

State and local leaders expressed frustration with the overwhelming amount of data and tools available, difficulty in selecting the right ones, and lack of granular data to inform local decisions. While they value the role of data for decision-making and communicating with their boards of advisors, they struggle with capacity to collect and report data alongside other duties. We found that Local Area Directors tend to rely on familiar data sources rather than strategically selecting the most relevant or accurate ones. Furthermore, the disconnect between federal and state requirements and the need for actionable data at the local level often resulted in friction and disengagement with the data collection process. Routine data collection was being completed just for the sake of collecting data rather than to meaningfully engage with the

data and generate insights to drive community planning. State leaders voiced similar frustration with rigid federal requirements that don't always align with Iowa's priorities, undermining motivation to collect and maintain high-quality data. Lastly, while states and localities may be instructed on what data to collect, they are not often given guidance on how to collect it, leading to further frustration and wide variation in both data collection methods and data quality.

The core insight from the Data Landscape Overview was that state and local leaders needed a standardised process and streamlined, user-friendly tools in order to collect and report higher quality data. Meanwhile, public deliberation revealed concrete ideas for building an interactive ECI data portal, as shown in Exhibit B.

Exhibit B: April 2021 public deliberation discussion questions and summary of responses

If you had access to an interactive ECI data portal, how would you use it?

- Apply for grants and prioritise funding
- Share data with state, local, and community partners
- Prioritise community plans
- Identify gaps in services
- Identify future needs (forecasting)

What type of information would help you better address the needs of your community?

- Longitudinal trends
- More recent data
- Statewide data that can be viewed by county or groups of counties and by rural vs. urban settings
- Unsuppressed data
- Narrative stories to add context to quantitative data
- Public safety data
- Housing/affordability data
- Data on who is enrolled in childcare
- Location of programs using evidence-based practices or promising practices
- Saturation rate of early childhood services compared to population of children 0-5
- Ripple effects of changes in one system on related programs (e.g., impact of expanding preschool on Head Start enrollment)

What functionality would be useful in a data portal?

- Ability to create community reports of early childhood indicators
- Breakdown data by zip code, and for larger metro areas, by neighborhood and Census block
- Compare data across counties
- Create dashboards and trend charts/tables
- Maps that are readable and interactive/clickable
- Download data visualisations by county, area, and/or statewide
- Data available across platforms and devices (e.g., smartphone, iPad, Android, desktop, etc.)

What initiatives beyond ECI should be considered in the development of a new tool (e.g., federal, state, local)?

- Federal: COVID relief, substance use/abuse
 - State / Governor: Workforce, Childcare Taskforce, broadband expansion for rural areas, mental illness/child mental health
 - Head Start performance standards/priorities
 - Medicaid priorities
-

Three actions to improve early childhood data collection and use in Iowa

Although our work is iterative and currently ongoing, the following actions have already led to major shifts in our data culture around the collection and use of relevant indicators within Iowa's early childhood system. We now have a streamlined set of indicators to support federal, state, and local needs; state and local leaders have received comprehensive training to enhance their capacity for working with these data and using them in annual strategic planning processes; and we built the IDD, which provides a single place to access the best available early childhood indicators for the State.

Action 1: streamlined Iowa's early childhood indicators for consistent use across the State

By creating a crosswalk of federal, state, and local reporting requirements we identified areas where data collection was redundant, inefficient, or lacked rigor. Based on these findings, our first step was to develop a refined set of ECI indicators and clear methods for measuring them. We started with a list of 15 ECI approved statewide indicators as of 2019 and 19 additional indicators recommended for consideration by I2D2 [20]. Recognising it would not be feasible to completely overhaul ECI's approved indicators all at once, we recommended a first step that would drop indicators

not currently available at the local level (e.g., serious crime, juvenile arrest), and add indicators readily available through I2D2 (e.g., poverty at birth, cumulative birth risk). We again relied on PAR and public deliberation methods to finalise a new set of indicators to present to the ECI State Board for approval. The proposal was approved, and over time I2D2 has supported ECI in refining these indicators to better meet federal, state, and local needs, as shown in Table 1.

Action 2: developed and delivered trainings to build data capacity for Iowa's state and local leaders

Although streamlining ECI's approved indicators and methods was a positive step towards reducing administrative burden and improving data quality, our participatory processes revealed that local leaders wanted more dynamic support to help them interact with and make decisions based on the data available. Through public deliberation we learned that only 44% of Local Area Directors felt prepared to use data effectively in communicating with their boards. They expressed a need for greater access to data along with additional training in data analysis, statistics, and translation to practical action. We began to address this gap with a series of training sessions organised around ECI's existing local needs assessment process. I2D2 led a training sequence for directors currently completing their needs assessment including live webinars that focused on skill development (e.g., how to find and use publicly available data from online sources and interpret and visualise statistical data) and fostering discussions with stakeholders to make meaning from data findings. We developed video tutorials for specific topics of interest (e.g., how to use the Census and KidsCount, two frequently cited data sources), and created structured protocols for facilitating focus groups, synthesising discussions, and translating data to action.

The training sequence aimed to shift the culture around data use. We wanted to empower local leaders to leverage their data more effectively and use it to improve decision-making. Since 2021, training has continued in various formats, shifting content in response to evolving needs of our state and local early childhood leaders (including the incorporation of the IDD as discussed in Action 3).

Action 3: built the Iowa Data Drive

Throughout the first year of trainings, it became clear that providing roadmaps for using existing tools was insufficient. Local directors reported inadequate time and resources to rigorously gather and synthesise data, and insights from the Data Landscape Overview and public deliberation revealed disparate needs between state and local leaders. State partners sought to analyse trends in key indicators over time at the state level and compare performance across counties and regional areas, whereas their local counterparts wanted more granular data to support decision-making within their own communities. Therefore, we needed an all-in-one platform to view, disaggregate, and manipulate Iowa-specific early childhood indicators.

A critical opportunity arose at this time to partner with an emerging national effort in data science that happened to be led by I2D2's co-director. Data Science for the Public

Good (DSPG) is an immersive summer program that enables university students to collaborate on projects that address local and state government challenges around critical social issues. This was the first summer the program was implemented in Iowa, replicating a national model developed with land-grant Universities led by the University of Virginia and funded by the US Department of Agriculture. Partner agencies (in this case, ECI) apply to be part of the program, provide a small amount of funding to support student summer assistantships, and are then paired with a team led by faculty and implemented by student and staff data scientists. Our I2D2 team provided additional support by having one of our data analysts work alongside the development team to bolster progress. Collective brainstorming, best-practice sharing across teams, and a structured curriculum to facilitate accountability supported a very quick development of our prototype interactive data portal. This moment reinforced for us how the often-unseen, deliberate work of building relationships, systems, and shared vision can position an IDS to respond nimbly and strategically when the right opportunity arises. While we were already moving to cultivate a dashboard solution that would have been built without the DSPG involvement, this opportunity helped move us forward more quickly and in a community with other teams so we could learn collectively and provide data science students with real-world learning.

The first iteration of the IDD launched in August 2021. While we have made several enhancements over time, core functionality has remained the same, including a user-friendly display of current ECI-approved statewide indicators and county-level data available in map, trend line, and tabular formats that can be compared across counties (see Exhibit C). Data are available for download as PDF versions of visuals, or as CSV files for further manipulation by more advanced users. Full descriptions of all data sources, elements, and definitions are provided on downloads to ensure appropriate use and citation of the data when it leaves the IDD.

Using our participatory approach, we consistently receive feedback about improvement opportunities and new needs for the IDD. This has required us to invest in skill development for existing I2D2 staff and to hire new team members with advanced training in data engineering, database management, data visualisation, statistical and geospatial analysis, data security, and project management. Currently, the I2D2 team (which manages all of I2D2 infrastructure, research projects, and the IDD) includes four full-time staff (Associate Director of Data & Analytics, Data Scientist, Program Manager, Data Analyst) and a flexible group of scientists that can expand and contract depending on project needs, including other faculty, postdoctoral scholars, and graduate and undergraduate students who may be only partially funded at any given time to work on I2D2 projects. The Director is a tenured professor who dedicates up to 50% time to run the system and lead research and analytic projects.

With this team in place, we are now working on Version 2.0 of the IDD that will include an expanded list of indicators (see Table 1) that address additional reporting needs of ECI and additional partners in Head Start and home visiting programs. For example, ECI has not yet been able to comprehensively see how the services they invest in are distributed across the state. In response, I2D2 recently built data collection tools to capture resource allocation, family service patterns, and program

Table 1: ECI approved indicators and Iowa Data Drive updates

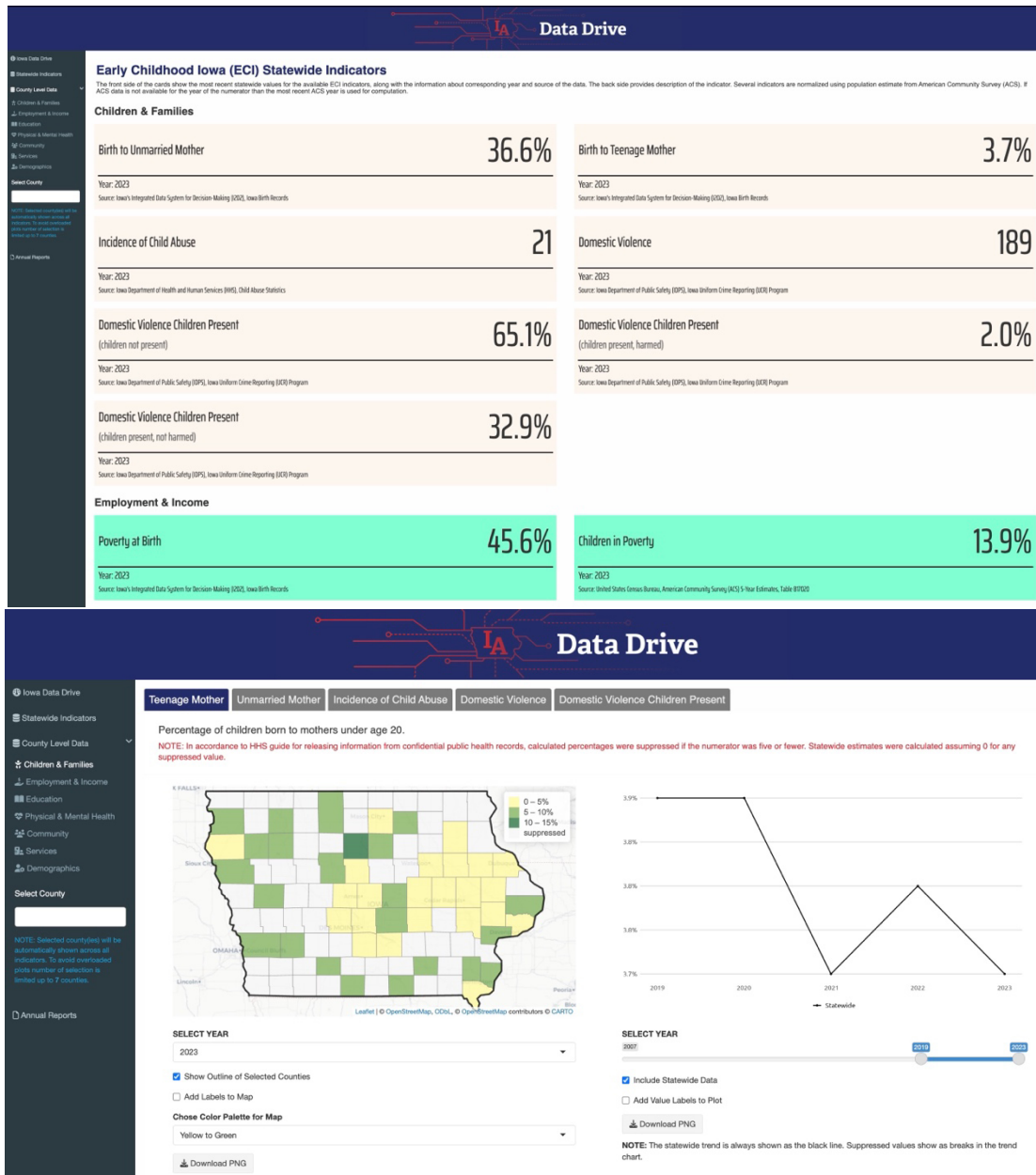
	Planning phase	Version 1.0	Version 2.0
Timeline	June 2019	August 2021	(planned)
Key Updates	ECI original approved indicators	Updated ECI approved indicators Added indicators frequently used by Local Area Directors and demographic measures	Added Data: – Head Start Program Performance Standards indicators – Breakdowns by demographics where available – New data categories reflecting community planning needs Added Functionality: – User-friendly county comparison & visualisations – Customisable dashboard: available by multiple service area options (i.e., ECI region, Head Start grantee)
Sample of Indicators—Birth Risks & Outcomes and Available Services	Birth risks & outcomes ◦ Low birth weight ◦ Teen births Services ◦ Dental services ◦ Availability of child care	Birth risks & outcomes ◦ Low birth weight ◦ Teenage mother ◦ Unmarried mother ◦ Infant mortality ◦ Inadequate prenatal care ◦ Prenatal tobacco exposure ◦ Preterm birth ◦ Low maternal education ◦ Poverty at birth ◦ Cumulative birth risks Services ◦ Dental services ◦ Children with health coverage ◦ Availability of childcare	Birth risks & outcomes ◦ Low birth weight ◦ Teenage Mother ◦ Unmarried Mother ◦ First time mother ◦ Inadequate prenatal care ◦ Prenatal tobacco exposure ◦ Preterm birth ◦ Low maternal education ◦ Poverty at birth ◦ Cumulative birth risks Services ◦ Child Care Assistance ◦ Supplemental Nutrition Assistance Program (SNAP) ◦ Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) ◦ Dental services ◦ Health coverage ◦ Transportation ◦ Early Care and Education Scholarships & Support Services ◦ Home Visiting

enrollment so that the IDD can include layered maps and trends of services relative to need. This expansion will allow our partners to measure child outcomes relative to service delivery and further refine their annual strategic plans. In addition, we are adding functionality to disaggregate data by relevant subgroups, such as race and ethnicity, sex, and language; layer

multiple indicators to showcase interactions (e.g., poverty by health risks); and provide additional visualisations to support cross-county comparisons. These enhancements have been developed through our public deliberation processes infused in regular stakeholder meetings and formal strategic planning events.

Exhibit C: Iowa Data Drive user interfaces

The following screenshots show 1) the main interface of the IDD 1.0, where users can view statewide indicators grouped by domain, and 2) the county-level interface, where users can drill down by county for each indicator, download data, and compare over time.



The IDD has enhanced data quality, simplified processes for state and local leaders, and fostered a common language about how data can be used to improve child and family wellbeing outcomes within a sector often marked by silos. Although it does not meet every reporting requirement, the IDD streamlines much of the work involved in reporting and decision-making for early childhood programs in Iowa. For example, Local Area Directors can now generate pre-populated or custom reports for a specific geographic area (e.g., county or collection of counties comprising a district or region) to inform their needs assessment process, rather than pulling information from up to 15 different sources as was their prior process. This shift has enabled state and local leaders to dedicate more time to strategic planning and goal-

setting and helped standardise requirements across programs serving similar needs. Communities can share their findings with other communities and identify common goals, share effective resources, and collaborate more effectively because they are using the same metrics to identify needs and direct services.

Discussion

The purpose of this paper was to demonstrate the value of a participatory approach in creating meaningful indices supporting early childhood strategic planning at the state and local level. Our work brought together community members,

public service leaders, and scientists to develop an actionable indicator tool that is now routinely used to evaluate and improve programming for young children and their families. This effort relied on a systematic, participatory, and mixed-methods approach grounded in a robust IDS.

We drew inspiration from other IDS efforts around the world that emphasise the importance of centering local community needs and public service partners in creating population-level data tools. For example, California's *Strong Start Index* leverages linked administrative data to measure children's assets at birth, identify areas to target additional family supports and track longitudinal fluctuations in assets at the community level [21]. Developed by the Children's Data Network—an IDS housed at the University of Southern California—this index was a collaborative effort involving state and local government agencies and community partners to ensure its practical utility for decision-making [22]. Similarly, the Administrative Data Research Centre Northern Ireland and the SAIL Databank in Wales illustrate the vital role of public engagement in IDS governance [23, 24]. By involving individuals and communities whose lives are reflected in the data, these systems have produced tools and research insights that benefit academic, government, and community partners alike. Building on these global practices, Actionable Intelligence for Social Policy (AISP) at the University of Pennsylvania has outlined methods for participatory approaches to developing IDS and data tools that are “legal, ethical, and a good idea” within their local contexts [25, p.2]. These examples and guidance have shaped our approach at I2D2 as we work closely with public service leaders to align data tools with community priorities and decision-making processes.

The success of our efforts has been realised through enhanced use of data in Local Area Board discussions and strategic planning. We have seen an increase in local capacity to seek and obtain additional funding from private foundations and grants to support their work using the IDD to document need and provide an avenue to track outcomes. At the state level, I2D2 resources are also being expanded through contracts with agencies to support annual evaluations and identify avenues for developing indicators and outcome measures for the child care workforce, home visiting expansion, and Head Start-preschool collaborations. In the wake of IDD implementation, state investments have recently included development of an entire set of dashboards focusing on child care supply and demand. These tools are shaping state and local policy, including consideration of resource allocations to ensure areas of the state with the greatest need have access to services.

While our mixed-methods, participatory approach has generated valuable data tools and strengthened local data capacity, it is not without limitations. The IDD has been shaped by the perspectives of stakeholders who are able to participate, potentially underrepresenting voices from communities with less ECI involvement. Additionally, analyses of data gathered through participatory processes relies heavily on interpretative synthesis, which may introduce bias despite efforts to engage a variety of stakeholders and use systematic procedures. We also acknowledge that the data contained in IDD is limited and continue to work to identify reliable and valid sources of population-level data that are relevant

for the programs using it. Some indicators are simply hard to capture in administrative data, like family preferences, waitlists and barriers to accessing services, and quality of programming—we need to continue working with partners to identify opportunities to build capacity for collecting these types of information routinely so they can become part of strategic planning tools like the IDD.

Nonetheless, the collaborative nature of our work has been essential to building tools that reflect shared priorities and foster continued engagement. I2D2 and ECI partners comprise diverse perspectives in promoting positive early childhood development that are united by a shared goal of using data effectively to ensure that “every child, beginning at birth, will be healthy and successful” [26] (p.2)]. Through this partnership and our participatory approach, we have built trust in I2D2 and the co-created data tools as reliable resources for translating rigorous science into actionable insights for public service leaders.

Key takeaways

Three lessons emerged from this work that can guide others seeking to build similar tools:

1. Lead with Partnership and the Product Will Follow.

When I2D2 began partnering with ECI, we did not know we would build the IDD. The foundation of our success was learning about and prioritising the needs of state agency and local community partners over predefined outputs or goals driven by academic aims. By cultivating a two-way partnership, we leveraged the expertise of scientists and community leaders and yielded to each other for guidance. Community partners provided critical insights into local needs, while scientists ensured rigor and standardisation. This strategy eventually resulted in a novel application of early childhood indicators through the IDD.

2. Build in Phases with Flexibility for Growth.

Effective partnerships leave room for changing contexts and opportunities. Through a phased approach with continuous partner engagement—rather than a “one and done” project—we focused on building data tools and training in response to current public service leader needs and iteratively tweaking based on feedback. This ongoing, flexible partnership positioned I2D2 to lead construction of the IDD when funding, timing, and priorities aligned. It also leaves us open and ready for new opportunities as they arise.

3. Communicate Clearly, Often, and in Multiple Modalities.

Clear, consistent communication is vital for creating a common language and ensuring that indices, indicators, or other data tools are actually used to drive evidence-based decision-making. We prioritised bidirectional feedback and identified opportunities for community members and public service leaders to discuss their successes, learnings, and needs, which built buy-in at each phase of the work. This often meant we found opportunities where stakeholders were already regularly gathered and participated as ongoing members. Rather than creating new spaces, new meetings, or new

communication channels, we became part of existing workflows. We also offered training opportunities in varied formats and found that there is no such thing as over-communicating when it comes to data. Rigorous documentation and reiterating indicator definitions, data sources, and methodological decisions in all outputs helped us maintain transparency and trust.

Conclusion

The success of the IDD illustrates the power of participatory approaches in creating data tools that align data systems with community needs. Following our own recommendations, we realise the IDD will continuously evolve in response to community partner needs. As investments in early childhood programming expand statewide under the ECI Strategic Plan 2025, we are committed to adapting the IDD to meet emerging priorities. Ultimately, this work demonstrates that integrated data systems can be a powerful catalyst for change when grounded in principles reflecting strong partnerships, iterative and flexible implementation, and clear communication. By centering local voices and fostering strong relationships, we have developed a tool that not only supports data-informed decisions but also improves services for young children and their families.

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Statement on conflicts of interest

I2D2 has received funded contracts from Early Childhood Iowa since 2018 to conduct statewide needs assessments, support strategic planning, and provide annual reports about program reach and impacts. Heather Rouse served as co-chair of the ECI Results Accountability Workgroup from 2020-2025. Cassandra Dorius was director of ISU's Data Science for the Public Good program from 2021-2024.

Ethics statement

This work was conducted as part of a funded contract with the Iowa Department of Human Services, Early Childhood Iowa. The project did not receive oversight from the Iowa State University Institutional Review Board as it involves secondary analysis of anonymised and aggregated data, and therefore does not involve human subjects research.

Data availability statement

Data supporting the findings of this study are available from Dr. Heather Rouse [hrouse@iastate.edu], upon reasonable request and approval from State partners.

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Abbreviations

U.S.:	United States
IDS:	Integrated Data System
I2D2:	Iowa's Integrated Data System for Decision-Making
IDD:	Iowa Data Drive
CCDBG:	Child Care & Development Block Grant
ECI:	Early Childhood Iowa
ISU:	Iowa State University
PAR:	Participatory Action Research
MIECHV:	Maternal, Infant, and Early Childhood Home Visiting
SNAP:	Supplemental Nutrition Assistance Program
WIC:	Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)

Supplementary Appendices

Supplementary Appendix 1 includes the interview protocol used with ECI Area Directors.

Supplementary Appendix 2 includes the survey questions asked of state and local early childhood leaders.

Supplementary Appendix 3 includes an expanded version of Table 1 with a full list of indicators used in each version of the Iowa Data Drive.

