Using Geographic Information Systems Mapping to Inform Early Childhood Education Policies and Programs

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Introduction

The experiences children have during the first five years of their lives are critical in determining their future educational outcomes. Research has demonstrated immediate benefits for children in literacy, mathematics, language development, peer relations and social emotional learning. Additionally, the long-term social and economic benefits of high-quality early childhood education (ECE: programs for children aged three to five, including home visiting, child care and preschool) show a strong return on investment. Additionally, families can benefit from access to early childhood education and high-quality child-care, which are directly related to improved parental workforce participation—particularly in low income populations.

These near and long-term benefits have supported the creation of numerous federal and state ECE programs. However, a recent report from the National Center for Education Statistics estimates that approximately 6.5 million children across the United States are not accessing ECE. In the report, of the parents who had trouble accessing ECE options, approximately 30% listed cost as the primary barrier, while nearly 60% listed location, lack of slots or quality.

How can states address these barriers and ensure that ECE programs and resources reach the populations that are most in need? To answer these difficult questions, policymakers need data to inform their decisions. One commonly available tool for making data-driven decisions related to availability and access to programs and services is Geographic Information Systems (GIS) software.

What Is GIS?

GIS software visualizes data by using layered maps. This can be as simple as creating location points, or as complex as analyzing how multiple layers of data relate to one another within different geographic boundaries (e.g. school districts, counties, or economic development regions). Common state uses of GIS include validating addresses to improve the accuracy of 911 systems and voter registration, drawing new boundaries for population-based election districts and mapping land parcels for planning or taxation purposes. GIS is a valuable data visualization tool for any issue area—including energy, environment, transportation, criminal justice and health—and can support policymakers’ efforts to improve services and outcomes. For developing early childhood education systems, GIS can be especially helpful.

Using GIS to Enhance Early Childhood Policy Analysis

To illustrate how GIS is applicable to early childhood education, consider how two common methods of policy analysis—needs assessment and gap analysis—can be enhanced by the inclusion of GIS mapping.

A needs assessment asks the question, “how effectively are resources or services distributed as compared to the overall demand from a targeted population?” In the map of California (Figure 1), we can quickly and clearly see the proportion of three- and four-year-olds that are accessing ECE opportunities in each county. This map helped policymakers in California identify specific locations for expansion of facilities and state-funded pre-K slots.
GIS also can be used to conduct a gap analysis, which asks, “What is the difference between the current service provision level and the ideal level?” The first map combines demographic data from the U.S. Census with early learning program enrollment data from the California Department of Education to paint a clearer picture of the gaps between need and programming. The second map (Figure 2) shows Imperial County in Southern California, where only 39% of three- and four-year-olds are accessing ECE opportunities and 16% of the eligible adults in the county are unemployed. By layering school districts and legislative boundaries, the user can quickly identify the state and local leaders that could collaborate to improve access and outcomes across the county.

Based on these types of analyses, state leaders have the ability to craft more precise ECE policies and programs. GIS is also well-suited to address a number of challenges that can often compromise implementation.

**Four Ways GIS Can Help Address Early Childhood Education Policy and Program Challenges**

**COMPLEX POLICY ENVIRONMENTS**

Transportation, housing, workforce and economic development policies can compromise the effectiveness of early childhood education policies. GIS can support state and local decision makers by providing a clearer understanding of how ECE policies and programs interact with policy outcomes from other sectors in order to leverage strengths and mitigate challenges.
SERVICE ACCESSIBILITY

Gaining access to ECE options can vary significantly based on where families live. Getting children to and from ECE programs in a safe and timely manner can be a significant challenge in rural and urban areas alike. Places of residence, work schedules, family structure and transportation options are just a few of the factors that constrain families’ access to programs. For example, part-time and service industry workers are more likely to have unpredictable schedules and be dependent on public transportation, which makes it particularly difficult to consistently participate in early learning programs. Where families live and work may not be where they can consistently access programs. GIS can help state leaders make decisions based on the concrete reality of peoples’ lives.

DATA QUALITY

132 federal programs distribute $675 billion in funds based on counts of eligible recipients within geographic boundaries. This means that accurate data for federal, state and local policy implementation is critical for the effective management and distribution of resources. ECE program data is often inconsistent in quality and availability. The data that is available on tracking children and program participation in different public and private settings typically comes from diverse sources and is prepared using methodologies and standards that are not uniform. State leaders can use GIS to combine existing early learning data with other data sources to improve the overall quality and accuracy of data-informed decisions.

STAKEHOLDER ENGAGEMENT

There are several ways in which states can use existing data and GIS software to generate new insights into the communities that are and are not being served by state-wide policies and programs. However, the true power of GIS-based analysis is that it provides a focal point for stakeholder engagement and collaboration. For example, in the map of Trinity County, Calif., the data clearly tells us that families are not effectively accessing ECE programming. However, it does not tell us why. Local leaders and community members know these details and state legislators can use their power to convene these stakeholders and seek their insights. GIS helps state leaders know where to go and whom to engage in order to identify the true strengths and challenges across different contexts and craft policies and programs accordingly.

Accessing GIS Resources

Utilizing GIS to improve decision-making is practical and doesn’t require new, large expenditures. States may have both the data and human capital to put GIS to work. Most state agencies have licenses to GIS software and staff who know how to update its content. At least 34 states have a Geographic Information Officer who is charged with promoting data quality and sharing across all levels of government. Some of these positions have permanent statutory authority, while others may be informal positions funded by grants or through partnerships with higher education institutes. From American Institutes for Research (AIR)’s work with state agencies across the country, they have found that state agency researchers and program staff are often unaware of the analytic potential of GIS. Once they know what’s possible, they are enthusiastic about making state and national data come alive through GIS mapping.

The best sources of relevant ECE data often come from state agencies themselves. Enrollment in state-run pre-K programs and social service programs are typically reported by the department of education, early childhood or health and social services agencies in each state. Birth rates are usually available from a state health department, and Head Start and Early Head Start enrollment by grantee is available through Program Information Reports (PIRs) from the U.S. Department of Health and Human Services. The level at which data is available will vary depending on reporting requirements set by state agencies.

Beyond state-level data, there are several national data sources that provide additional helpful information in the context of early childhood education. Data from the U.S. Census Bureau, particularly the American Community Survey (ACS), provides an array of demographic and economic information that can be summarized in different geographic units. In addition, the National Center for Education Statistics (NCES) Common Core of Data lists every public school and school district in the U.S. It contains geographic coordinates for each school and school district, along with a wealth of data related to student enrollments, staffing and other school characteristics.
Conclusion and Next Steps

Despite widespread agreement on the educational benefits of ECE and sustained efforts at different levels of government, a large segment of the population remains underserved. The reasons for these gaps are complex and entangled. GIS maps are uniquely capable of combining a lot of disparate, complicated data and presenting state leaders with a clear, informative and actionable picture of which policies and programs are needed in specific places. GIS can be an essential tool for policymakers trying to meet the challenge of increasing access and participation in high-quality, affordable early childhood programs. There are four easy steps state leaders can take to add GIS to their toolbox:

- **Contact your state’s Geographic Information Officer.** Often this position is located within the office of the Chief Information Officer, or may even be fulfilled by the Chief Information Officer.

- **Ask questions.** Your state might already use GIS for policy analysis, or it might have the capability to do so. Think about what your needs are and find out how you can tap into existing resources.

- **Familiarize yourself with how GIS is used.** Story maps are a great introductory resource to see how data can be visualized and conveyed. They can provide an immersive look into an issue by using data to tell a story. These resources from the Texas Legislative Council use data to create district profiles and visuals relevant to policy issues in the state.

- **Get help.** If you have additional questions or would like to hear more about how other states are using GIS to inform policies and programs, please contact:

Questions?

- **For the policy side of GIS mapping questions:** Contact Adrienne Fischer, Policy Associate, Education Program, NCSL at Adrienne.fischer@ncsl.org

- **For GIS mapping-specific questions:** The place-based decision-making team at AIR is available to answer questions and provide support. Please contact Trent Sharp at tsharp@air.org for more information.
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