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THE DEVELOPMENT OF THE FORSYTH COUNTY NEIGHBORHOOD OPPORTUNITY ATLAS (FCNOA): BENCHMARKING A COMMUNITY'S PROGRESS TOWARDS SPATIAL JUSTICE

Russell M. Smith
Winston-Salem State University

Zachary D. Blizard
Winston-Salem State University

ABSTRACT

In the Summer of 2021, the Spatial Justice Studio (SJS) was contracted to develop a Neighborhood Opportunity Atlas (NOA). The focus of the proposal was to provide a holistic analysis of conditions across Forsyth County that can be used to identify, compare, and assess neighborhoods now and into the future for planning, programming, budgeting, and evaluation. The atlas is an innovative, statistical, and geographic product that provides quantitative census tract level information for a wide range of community indicators and began a process to identify, target, and tackle underperforming neighborhoods. The NOA uses a combination of the knowledge of urban studies and the power of data science to explore opportunities and challenges at the census tract level. By combining these two areas, Forsyth County can get an accurate baseline for existing conditions within communities throughout the county and target programs, policies and budgets to help all neighborhoods achieve a level of spatial justice. This paper seeks to share the process, problems, and potential of a "Neighborhood Opportunity Atlas" for communities who are dealing with myriad issues and are searching for quantitative methods by which to tackle these issues.

KEYWORDS

Community, Data-Driven, Data Dashboards, Spatial Justice

INTRODUCTION

Communities across the United States face persistent inequalities and injustices, including disparities in public services, a lack of affordable housing, and food deserts. Many of these disparities constitute forms of spatial injustice—systemic imbalances that disproportionately affect specific spaces, neighborhoods, and communities (Soja, 2013). The spatial manifestation of these issues presents a critical opportunity to investigate why certain challenges arise in specific locations. By leveraging urban studies and data science, communities can systematically identify, analyze, and address various forms of spatial injustice.

The availability of data has never been greater, offering communities a wealth of information to better understand their local conditions. From U.S. Census data to locally sourced datasets, cities and municipalities have unprecedented access to quantitative insights. Urban data analytics and interactive dashboards have become valuable tools in translating these data into actionable solutions for the

public good. Large cities such as New York and Chicago have embraced urban data analytics to engage citizens in addressing complex urban challenges (City of Chicago, 2025; City of New York, 2025). For example, Boston has successfully utilized crowdsourcing through the 'Street Bump' app to identify and repair potholes (Street Bump, 2017). Additionally, municipal governments increasingly rely on data-driven tools to enhance efficiency across various administrative functions (Kitchin et al., 2015; 2017).

Communities in North Carolina are also beginning to recognize the potential of data science to tackle complex problems. Forsyth County, NC, recently launched an initiative to integrate data-driven decision-making into community planning efforts. In the summer of 2021, the county issued a call for proposals aimed at utilizing data to provide a more comprehensive analysis of local conditions. Specifically, the county sought the development of a tool capable of identifying, comparing, and assessing neighborhood-level opportunities—both now and in the future—to inform planning, programming, budgeting, and evaluation efforts.

This paper explores the development and implications of a "Neighborhood Opportunity Atlas" designed to support North Carolina communities in addressing spatial injustices through quantitative methods (FCNOA, 2025a). The remainder of the paper is organized as follows: Section 2 reviews relevant literature, while Section 3 provides background on Forsyth County's previous data-driven initiatives. Section 4 details the study's methodology, followed by a discussion of key findings in Section 5. Finally, Section 6 presents conclusions and outlines potential next steps.

LITERATURE REVIEW

The amount of data available around the globe is truly astonishing. According to Statista.com, "The total amount of data created, captured, copied, and consumed globally is forecast to increase rapidly, reaching 64.2 zettabytes in 2020 (equivalent to 64.2 trillion gigabytes). Over the next five years up to 2025, global data creation is projected to grow to more than 180 zettabytes" (Taylor, 2024). Much of this data is being generated in urban environments, which has led many people to ask, how can this data be used to improve our communities?

One potential use of the data is through the development of community dashboards. Community dashboards are digital platforms that visualize data to support decision-making, enhance transparency, and improve community engagement. These dashboards aggregate and present various datasets, including socioeconomic indicators, environmental metrics, and public services, to inform policymakers, organizations, and citizens. The Neighborhood Opportunity Atlas is like a dashboard, from which communities can check the 'temperature' of a variety of issues afflicting the community. Jing, et al. (2019) discuss the potential of geospatial dashboards in monitoring smart city performance. The NOA is akin to a geospatial dashboard for Forsyth County. Academic research on dashboards shows that they are utilized for a myriad of reasons ranging from community-wide benchmarking to issue specific projects (Kitchin et al., 2015). Additional research has focused on the design of dashboard and how to collect and visual data through dashboards (Grey et al., 2016; Young and Kitchin, 2020).

Dashboards grew in popularity following their use during the COVID19 pandemic. For most of the citizenry, this was people's first exposure to the power and potential of a community dashboard (Dong et al., 2020). However, dashboards can have limitations and McArdle (2017) has identified six key issues to consider when developing a dashboard. These issues include epistemology, scope and access, veracity and validity, usability and literacy, use and utility, and ethics. Few (2012) and Heer et al. (2016) both highlight the need for the inclusion of community stakeholders in the dashboard design process to ensure usability and relevance. Finally, Tufte (2001) found that a wide variety of visualization techniques including bar charts, heat maps and geospatial representations, help to facilitate comprehension. While not perfect, dashboards provide a unique way of sharing and showing data to the public to be transparent and accountable.

BACKGROUND/OVERVIEW

Forsyth County is in the Piedmont Region of North Central North Carolina. According to 2020 U.S. Census data, Forsyth County has a population of approximately 395,000 (U.S. Census Bureau Quick facts, n.d.) and the largest city is Winston-Salem. The county has a rich agricultural and manufacturing heritage. R.J. Reynolds Tobacco, Hanes Brands and regional banking companies have all called the County home. Over the last several decades, the county has experienced a shift in economic activities from manufacturing to services and technology (Norby 2009). This has resulted in some residents experiencing prosperity, while others have been left behind. According to a report by Chetty, et al. (2014) Forsyth County is the third worst county in the United States for economic mobility. Residents in some Forsyth County neighborhoods face limited economic mobility due to geographic disparities, while others thrive. This two-fold reality manifested itself in the county, through an uneven pattern of development that has been reinforced over the decades by prejudicial planning practices, private disinvestment and racist practices and general neglect (Herbin-Triant, 2019; Smith, 2019; Rothstein, 2017; Usher, 2015). In sum, parts of Forsyth County prospered, others declined, and a spatially unjust geography ensued.

Beginning in the mid-2010s, Forsyth County sought a way to explore the growing inequalities across communities within the County (e.g. urban v. rural, East v. West, etc.). As a result, the Distressed Community Report was developed by MapForsyth. MapForsyth is the City-County Department charged with developing, maintaining, and utilizing geographic information for Forsyth County. The Distressed Community Report examined a wide variety of 'standard' variables across Forsyth County (e.g. median household income, poverty level, unemployment rate, etc.). The result of this endeavor was the creation of numerous maps that all highlight the same stretch of poor performing neighborhoods that run along the eastern side of US 52. The neighborhoods identified by this predecessor to the NOA, have been communities of color and have been impacted by redlining, urban renewal, and prejudicial planning practices (City of Winston-Salem, 2021, Jones- Correa, 2000). This report was updated several times, with new data, but the findings were always the same: East Winston was performing poorly along most metrics.

Armed with this already known information, the County sought a new and innovative way to expand the Distressed Community Report to shed light on the nuanced differences afflicting unique geographies. To that end, the county issued

a call for proposals to rethink and reimagine the Distressed Community Report as a more useful and insightful tool by which local government, non-profits, the private sector, and individual residents could learn more about their community and find solutions to historical problems afflicting spaces across the County.

The Spatial Justice Studio @ the Center for Design Innovation answered the call for proposals and was contracted to develop what would become the Neighborhood Opportunity Atlas (NOA). The focus of the proposal was to provide a more holistic analysis of conditions across the county that can be used to identify, compare, and assess neighborhoods in Forsyth County now and into the future for planning, programming, budgeting, and evaluation. The atlas was presented as an innovative, statistical, and geographic product that could provide quantitative census tract level information for a wide range of community indicators and begin a process to identify, target, and tackle underperforming neighborhoods.

The mission of the Spatial Justice Studio (SJS) is to establish and sustain inter-institutional, interdisciplinary, and inter-sectoral programs that bring faculty, students, and the community together across disciplines into diverse experiences to develop meaningful solutions to issues related to spatial (in)justice. SJS explores alternative possibilities for urban areas and ways of achieving more equitable urban futures through active research agendas, engaged teaching practices and community based participatory research which will lead to the creation/regeneration of equitable, functional, and sustainable communities for all (Spatial Justice Studio 2023).

The goals of the NOA included: developing a holistic analysis of neighborhood conditions across a wide range of variables; expanding upon the Distressed Communities Report – 2016; creating a 'benchmark' document for evaluating projects, programs and budgets; and growing conversations focused on making decisions that promote access, equity, inclusivity, justice and sustainability within Forsyth County. The NOA uses a combination of the knowledge of urban studies and the power of data science to begin to explore opportunities and challenges at the census tract level. By combining these two areas, Forsyth County can get an accurate baseline for existing conditions within communities throughout the County and target programs, policies and budgets to help all neighborhoods achieve a level of spatial justice.

METHODOLOGY

There is a wealth of data available about neighborhoods across the United States, and the FCNOA aimed to collect and present the most useful information in various formats to serve a broad range of users. Our first set of results, Tract Facts, provides summaries for each of Forsyth County's 95 neighborhoods (census tracts). The second set includes interactive maps, while the third offers detailed tables of results.

Tract Facts includes summary write-ups for each neighborhood, highlighting key demographic details, major landmarks, and features that significantly differ from the county. For example, Figure 1 shows the first page of a tract's summary, which includes the tract's geographic dimensions, location within the county, and key demographic statistics (FCNOA, 2025b). Notably, key landmarks and major roads

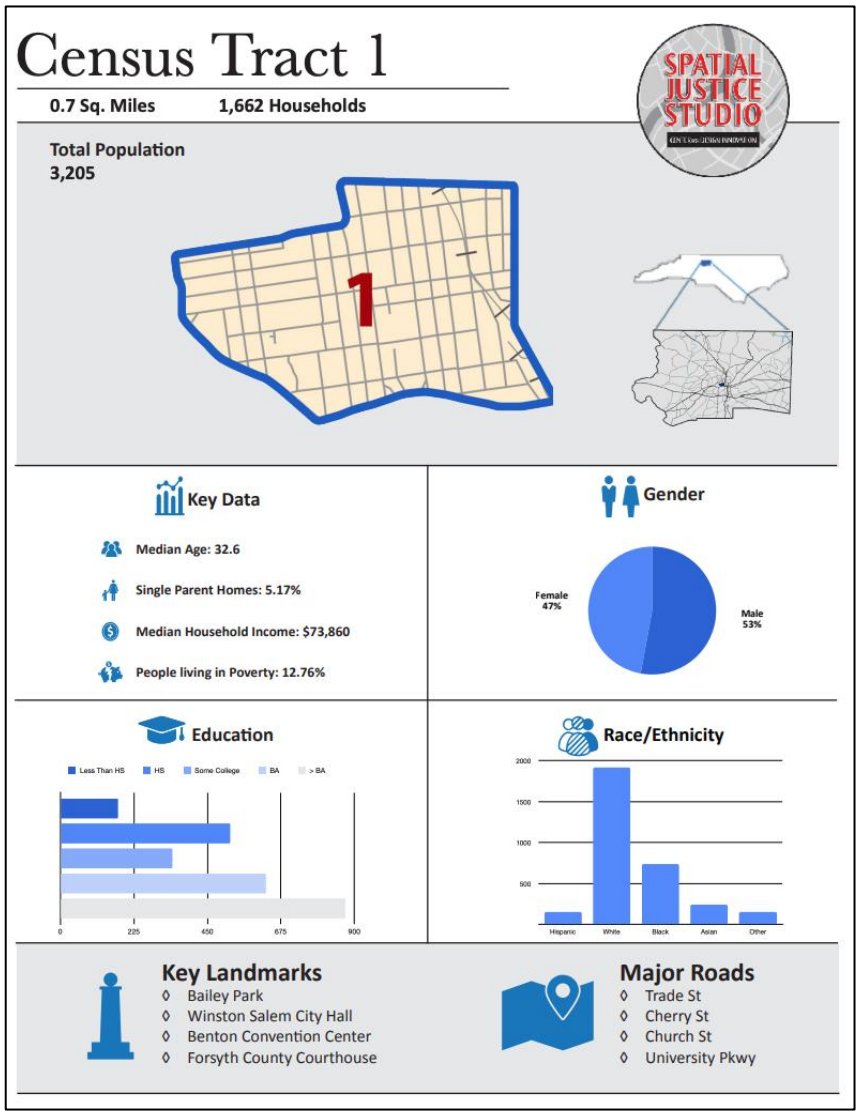


Figure 1. *Tract Fact Sheet: Part I*

are also listed. This summary offers a high-level description of the neighborhood's key characteristics.

Figure 2 displays column charts comparing five key variables where the neighborhood differs significantly from the county (FCNOA, 2025b). Blue bars indicate better performance relative to the county, while red bars highlight areas where the neighborhood performs worse. For instance, in the first row, second column, the crime rate in the tract (519) is significantly higher than the county's average (130.6).

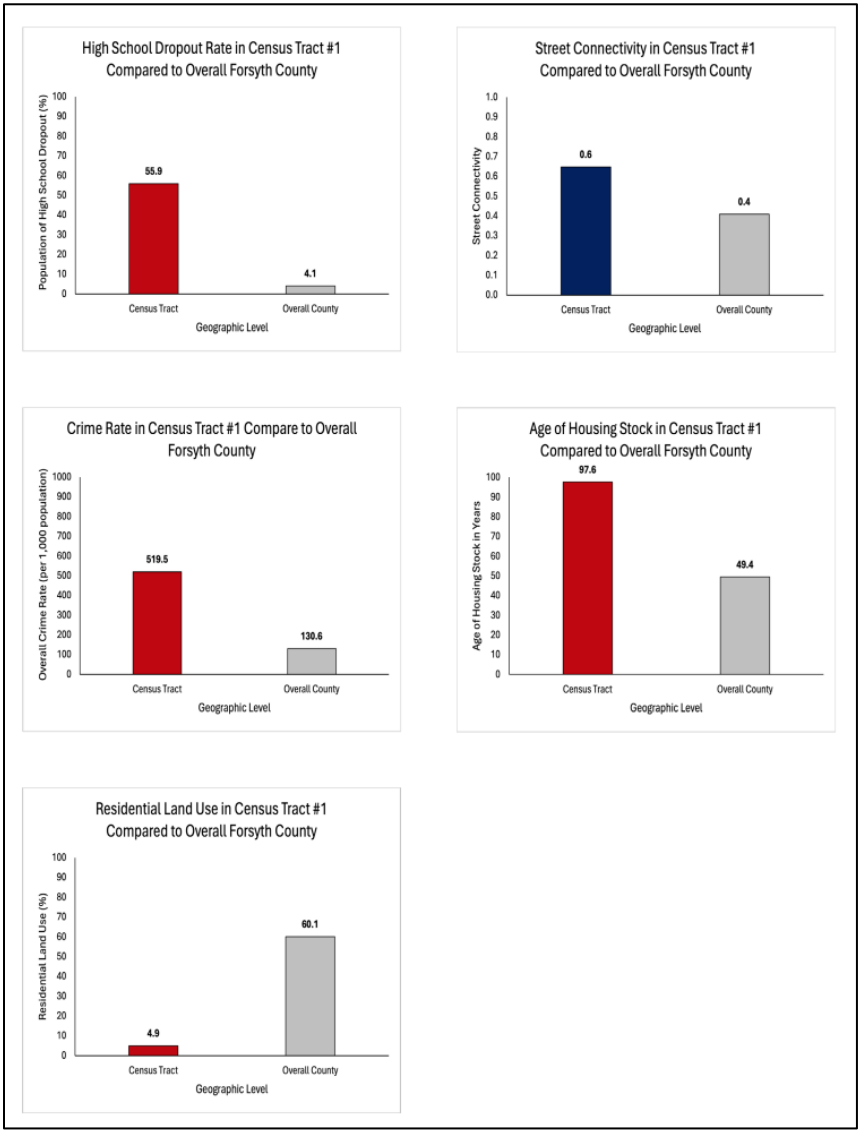


Figure 2. *Tract Fact Sheet: Part II*

To assess the differences between neighborhoods and the county, the FCNOA converted neighborhood-level data into z-scores and tested for statistical significance. Next, the z-scores were mapped across Forsyth County, with bluer areas indicating neighborhoods that perform better than the county, and redder areas indicating those that perform worse. This allows users to quickly see how individual neighborhoods compare to the county overall.

The project includes a wide variety of variables, categorized into seven key domains: 1) Access & Infrastructure (e.g., distance to grocery stores), 2) Built

Environment (e.g., property conditions), 3) Justice & Social Capital (e.g., voter participation rates), 4) Economic Well-Being (e.g., poverty rates), 5) Education (e.g., school performance scores), 6) Health & Wellness (e.g., opioid overdoses), and 7) Demographics (e.g., migration). In addition to the snapshot maps for each year, the FCNOA also included maps showing changes over time, allowing users to observe both the current state and trends in neighborhood performance.

For example, Figure 3 shows a map of voter participation rates in the 2020 General Election (FCNOA, 2025c). Redder areas indicate lower participation rates relative to the county, while bluer areas show higher rates. The map reveals that tracts in the eastern part of the urban center have significantly lower participation, while those in the western part of the county have higher participation. Hovering over a tract will display additional details in a pop-up window.

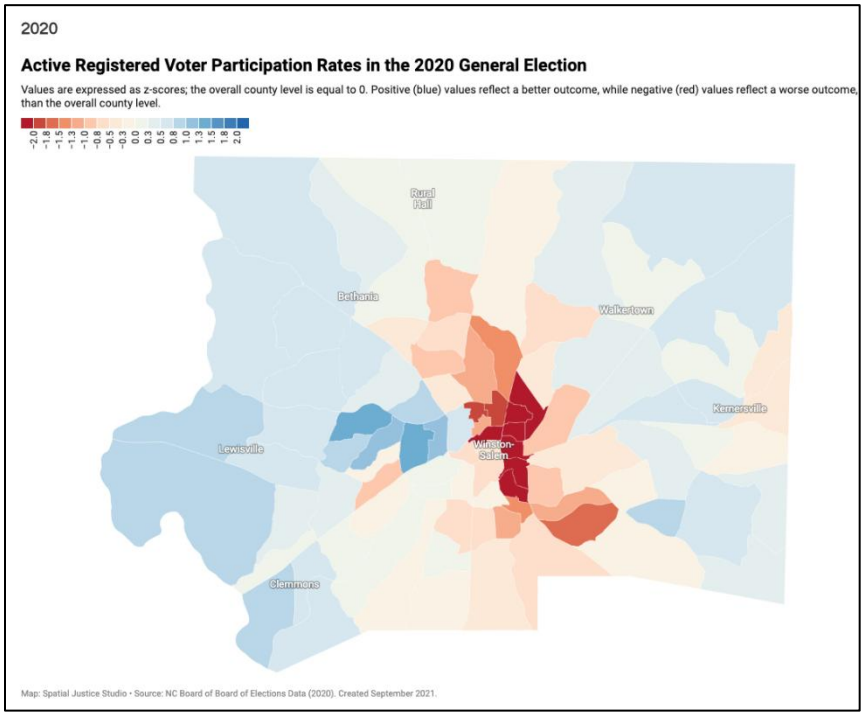
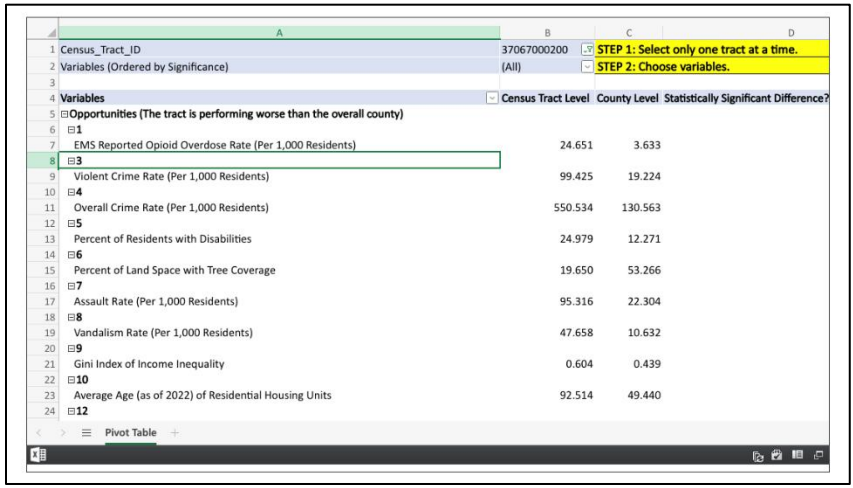


Figure 3. *Interactive Map on the FCNOA*

The creation of an overall Neighborhood Opportunity Index aggregates all individual measures into a single score. Higher values on this index indicate greater opportunity, while lower values suggest less opportunity. The map further highlights the top and bottom three domains where each neighborhood excels or faces challenges.

For users who prefer data in tabular form, the FCNOA offers an interactive table that allows users to select different census tracts and view all measures in one place, ordered by how each tract compares to the county overall. Figure 4 illustrates the interactive table for census tract 200, showing the variables where the tract performs worse than the county (FCNOA, 2025d). Notably, opioid overdoses in this tract (24.7) are significantly higher than the county's rate (3.6), marking this as the area with the greatest disparity.



	A	B	C	D
1	Census_Tract_ID	37067000200	STEP 1: Select only one tract at a time.	
2	Variables (Ordered by Significance)	(All)	STEP 2: Choose variables.	
3				
4	Variables	Census Tract Level	County Level	Statistically Significant Difference?
5	⊟Opportunities (The tract is performing worse than the overall county)			
6	⊟1			
7	EMS Reported Opioid Overdose Rate (Per 1,000 Residents)	24.651	3.633	
8	⊟3			
9	Violent Crime Rate (Per 1,000 Residents)	99.425	19.224	
10	⊟4			
11	Overall Crime Rate (Per 1,000 Residents)	550.534	130.563	
12	⊟5			
13	Percent of Residents with Disabilities	24.979	12.271	
14	⊟6			
15	Percent of Land Space with Tree Coverage	19.650	53.266	
16	⊟7			
17	Assault Rate (Per 1,000 Residents)	95.316	22.304	
18	⊟8			
19	Vandalism Rate (Per 1,000 Residents)	47.658	10.632	
20	⊟9			
21	Gini Index of Income Inequality	0.604	0.439	
22	⊟10			
23	Average Age (as of 2022) of Residential Housing Units	92.514	49.440	
24	⊟12			

Pivot Table

Figure 4*. Interactive Pivot Table on the FCNOA*

DISCUSSION AND CURRENT STATE OF AFFAIRS

Now in its fourth year, the Neighborhood Opportunity Atlas (NOA) has continued to expand, update, and reach a broader audience. Since its inception, the NOA has identified both challenges and opportunities across Forsyth County, offering a more nuanced analysis of the various factors influencing residents' quality of life. Currently, the NOA includes over 50 variables across seven categories—Access & Infrastructure, Built Environment, Justice & Social Capital, Economic Well-Being, Education, Health & Wellness, and Demographics—providing a comprehensive and detailed picture of conditions at the census tract level. Additionally, select variables have been designated for longitudinal analysis, enabling assessments of change over time.

While many historically disadvantaged census tracts continue to experience systemic challenges, the NOA's in-depth analysis has also revealed areas of progress. One notable finding was that some communities traditionally classified as "disadvantaged" performed comparatively well on several access-related factors, including healthcare availability, grocery store proximity, street connectivity, and broadband access. These findings suggest that, geographically, these communities possess foundational assets that could support further improvement. Conversely, the NOA also highlighted that some suburban communities—often perceived as "better off"—face significant accessibility challenges. Without private automobiles, residents in these areas may struggle to access essential services, signaling potential future concerns.

The NOA's greatest strength lies in its ability to facilitate multiple community-driven functions, including issue identification, budget prioritization, and program evaluation. First, the NOA provides a data-driven approach to identifying the most pressing community needs. While data alone cannot determine priorities—political considerations and community input remain essential—the NOA offers a user-friendly tool for identifying statistically significant issues. Second, the NOA's data visualization dashboard enables users to track changes over time, allowing for the assessment of program and policy impacts. Before the NOA's development, funding decisions for nonprofit initiatives often relied on historical trends and anecdotal evidence. Now, Forsyth County can require funding applicants to demonstrate how their projects align with NOA data and establish measurable community impact benchmarks.

In the past year, greater efforts have been made to increase public awareness and engagement with the NOA. Until 2024, the tool was primarily used by Forsyth County staff—particularly within the Public Health Department, the Department of Social Services, and City-County Planning—to access critical data on various community challenges. However, recognizing the value of broader public involvement, the county dedicated the project's fourth year to expanding outreach. A series of community workshops were organized to educate residents, nonprofits, and community organizations about the NOA's history, purpose, data variables, and applications. These workshops have fostered a deeper understanding of Forsyth County's most pressing issues while providing elected officials, county staff, and community members with a shared foundation for addressing quality-of-life improvements.

CONCLUSIONS

The volume of publicly available data is growing exponentially, prompting cities and counties across the United States to explore innovative ways to share this information with the widest possible audience for maximum impact. Efforts to develop dashboards, online maps, and other digital tools aim to make data more accessible, enabling communities to ask new questions and devise data-driven solutions to pressing local challenges.

In Forsyth County, NC, elected officials, county staff, and residents recognized the potential of online tools to enhance data accessibility. This led to the development of the Forsyth County Neighborhood Opportunity Atlas (FCNOA), an interactive tool that compiles and visualizes county-specific data across more than 50 variables, with ongoing expansion. The FCNOA serves as a shared foundation for stakeholders—government agencies, nonprofit organizations, and residents—to understand community conditions and use data for problem identification, program evaluation, budgeting, and trend analysis. By providing all groups with access to the same dataset, the FCNOA facilitates informed discussions about the county's most pressing issues and fosters collaboration in developing solutions.

Over the past four years, the FCNOA has played a crucial role in bridging gaps between community data and decision-making. However, several challenges remain. First, not all entities within the county actively utilize the FCNOA, and concerns over data as a form of power have, at times, hindered the inclusion of new datasets. Second, the county has yet to formally integrate the FCNOA into its budgeting and programmatic processes. Although discussions have taken place

within county government, the use of the FCNOA is not mandated for funding requests or problem identification. Establishing explicit guidelines that require the FCNOA's use in these processes could lead to more equitable and data-driven decision-making. Finally, the project currently operates on a year-to-year basis, raising concerns about its long-term sustainability.

Despite these challenges, the FCNOA demonstrates how communities can leverage data to improve residents' quality of life. While not without limitations, the tool provides a critical starting point for more inclusive and evidence-based decision-making. The introduction of community workshops in Year 4 has expanded public engagement, demonstrating the power of data to those interested in using it for local improvement.

As a result of the new emphasis on community engagement, more than 1,100 individual users have accessed the website since May 2024. Those users represent a third of all users to the site since its establishment in 2022. The method by which users came to engage with the FCNOA website in the last year varies with 676 connecting through a direct entry of the website's address, 192 through a referring link, and 180 by way of organic searches according to Google analytics. The two most visited pages, after the home page, are the Tract Facts page and Data Details page. Both pages contain a lot of content, unlike the one-dimensional map pages. Moving forward, the FCNOA aims to incorporate additional community-identified variables, address sustainability concerns, and advocate for its integration into Forsyth County's formal budgeting and program evaluation frameworks.

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