The Journal of Extension

Volume 63 | Number 3 Article 19

8-16-2025

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Recommended Citation

Van Leuven, A. J., & Conroy, T. (2025). Using Economic Data to Understand Local Childcare Challenges. *The Journal of Extension, 63*(3), Article 19. https://open.clemson.edu/joe/vol63/iss3/19

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JOURNAL OF Extension

Feature Article

Volume 63, Issue 3, 2025

Using Economic Data to Understand Local Childcare Challenges

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Abstract. The childcare sector holds vital implications for community development. Overcoming barriers to access and affordability requires a nuanced understanding of this complex sector, a requirement that is further complicated by limited data availability. This paper reviews key data sources and uses historical business data to explore and analyze trends in childcare establishment availability by region. Supplementing the analysis is a discussion of the implications for community economic development by Extension professionals, including the importance of data literacy and the need to support local childcare providers.

USING ECONOMIC DATA TO UNDERSTAND LOCAL CHILDCARE CHALLENGES

Access to adequate childcare is a challenge faced by communities across the United States. While recent economic hardships—including the COVID-19 pandemic, supply chain shocks, and inflationary pressures—have brought the childcare shortage into the limelight, concerned stakeholders have long identified the scarcity of providers, lack of capacity, and the expense of childcare as major problems in their communities (Buffett Early Childhood Institute, 2016).

While shortages persist over time and affect every state in the United States, the severity and exact nature of problem varies. A recent survey of U.S. households found significant differences between states in the share of families with children under five who couldn't access childcare in the past four weeks, ranging from 10% to nearly 40% (Lurye, 2022). Recent surveys indicate that up to 55% of Oklahoma's population lacks access to quality childcare (Center for American Progress, 2019), and more than two-thirds of Wisconsin parents said that caring for children, accessing daycare, and paying for daycare all became more difficult during the pandemic (Conroy & Runge, 2021). Evidence suggests that rural families face even greater hardship, having to cobble together informal care arrangements due to too few options (De Marco et al., 2009).

The shortage of care has far-reaching impacts on the economy. When parents cannot find care for their children, they may have to miss work, reduce hours, find a job with more flexibility, or leave the labor force altogether. In the current context of a labor shortage where employers are struggling to find workers, barriers to employment are felt not just by the workers themselves but by their employers who cannot fill vacancies and miss out on sales and growth. According to a survey of over 1,000 small business owners, a lack of childcare is causing problems for more than half of businesses due to issues such as with scheduling, hiring, employee turnover, service delivery, and growth (Small Business for America's Future, 2021).

The childcare shortage is not merely a challenge for individuals and households, but rather, it is an economic development concern that requires community-level analysis and action. Yet, the nature of childcare businesses and the datasets available to track them make it difficult to assess the shortage and its causes at a local level. Research identifying *childcare deserts*—areas with "little or no access to quality child care" (Malik et al., 2018)—have gained recent prominence. These cross-sectional snapshots can be useful for identifying spatial imbalances of childcare availability (Dobbins et al., 2016; Sipple et al., 2020) at a given moment in time, but they are of limited use in identifying important *trends* such as increases and decreases from one year to the next and their causes. A more complete analysis requires a detailed data evaluation over time.

There are few sources for data (a) that describe childcare availability comprehensively (b) for small local geographies, and (c) over time, and even those that are available have important limitations. Data sources from the federal government are highly reliable and broadly available but are somewhat limited in coverage and are often subject to substantial time lags. Proprietary data can have the highest level of detail but may also raise questions of reliability and be cost prohibitive. State administrative data from agencies overseeing childcare can also have valuable detail, but it is not broadly available in a consistent research-friendly format. The trade-offs between detail, timeliness, availability,

and reliability make it difficult to choose a single source and accurately evaluate the childcare shortage from community to community. The best data source depends on the question, and a comprehensive assessment may require using multiple sources.

Though not without limitations, the data that *is* available can be used to gain useful insights. We explore the data available to demonstrate and discuss the strengths and limitations of each, particularly for small geographic areas over time. We then analyze trends in childcare establishment availability using historical business records, exploring temporal and spatial patterns as well as the dynamics and determinants of entry and exit. To conclude, we discuss the connection between these trends in childcare availability and the work of local Extension professionals, listing several implications for community economic development.

CHILDCARE AS COMMUNITY ECONOMIC DEVELOPMENT

To understand the importance of childcare for the economy, it is necessary to first understand how children impact parents' (and especially mothers') labor market outcomes. The results of a Washington Post poll show that three-quarters of mothers and half of fathers have passed up professional opportunities, switched jobs, or quit in order to care for their children (Paquette & Craighill, 2015). Indeed, women with young children have lower labor force participation (see Bauer et al., 2021; Women's Bureau, 2016) and even those participating in the labor force are more likely to work part-time (Landivar et al., 2022). Evidence from the October 2022 Current Population Survey indicates that the number of people who couldn't work because of childcare problems was over 100,000—higher than any month during the pandemic (Peck, 2022).

Children have also been found to have a detrimental effect on women's earnings. The negative impact of children on female wages, or "the motherhood penalty" is well documented across decades of academic work (see Gough & Noonan, 2013, for a review). The most recent work acknowledges that children affect female earnings through a variety of mechanisms (Angelov et al., 2016; Cortés & Pan, 2020; Kleven et al., 2019). Children, or even the expectation of having children, can affect choices about education, professional pathways, and preferred job characteristics, and these must be included to fully account for the effect of children on female earnings. Following this approach, Cortés and Pan (2020) find that children account for more than two-thirds of the gender pay gap. This implies that most of what remains of the gender wage gap today is due to the differential impact of children on men and women.

The evidence suggests that children continue to negatively impact women's labor market outcomes. This is not surprising given that the United States has not made significant strides in implementing family policies such as maternal/paternal leave and childcare compared to other developed countries (Waldfogel, 1998). However, supporting working families is crucial to alleviate the childcare responsibilities that limit economic growth, especially for working mothers. Several studies show that increasing childcare availability is linked to female labor force participation at the local (Conroy, 2019; Herbst & Barnow, 2008; Stolzenberg & Waite, 1984) and national level (Blau & Kahn, 2017). In addition, Bub and McCartney (2004) discovered that the number of hours spent in childcare correlates with increased employment hours and higher maternal wages, particularly for highly educated women.

Beyond the impacts on workers themselves, childcare shortages also impact employers. When workers have to reduce hours, turn down promotions, and quit or face disciplinary action from employers such as dismissal, demotion, or transfer (Shellenback, 2004), it can mean lower profits. Belfield (2019) finds that, each year, turnover and absenteeism due to insufficient childcare costs businesses in the range of $1,500 per working parent. A recent report by the UC Berkeley Law Center found that providing childcare decreased employee absence by 20–30% and reduced turnover by 37–60%, suggesting substantial savings for businesses as a result of establishing childcare accessibility (Powell et al., 2019). As childcare availability (or the lack thereof) affects a wide range of local economic outcomes—including jobs, income, and human capital—experts have suggested that it be regarded as an economic development issue (Kimmel, 2006; M. Warner et al., 2003).

DATA SOURCES THAT DESCRIBE LOCAL CHILDCARE AVAILABILITY

Communities wanting to better understand the problem of childcare for purposes of improving the quality of life for residents and local businesses will need reliable data. A thorough analysis requires data that describes childcare availability comprehensively for small geographic units over time. We consider four primary data sources: the Quarterly Census of Employment and Wages, County Business Patterns in combination with Nonemployer Statistics, third-party proprietary data, and state administrative data. Each data source corresponds with a particular set of limitations and advantages, most of which do not overlap with one another.

Once limited to data that meets the criteria of (a) systematic inclusion of childcare providers, (b) availability at small geographic levels, and (c) availability over time, there are few options for *how* to measure childcare availability. Ideally, childcare availability would be described based on capacity, measured in terms of the number of available spots

in a given place by age, any waitlist for those spots, hours of availability, and the ability of families to pay for available spots. (Childcare capacity is an important data point due to the heterogeneity in available capacity among establishments in a specific geographic area. For instance, two counties may have an identical number of childcare establishments, but one may have significantly more capacity if its childcare options are primarily center-based rather than home-based.) That is, we would want to account for supply and access to that supply from both a spatial and financial perspective. While we describe one data source that includes data on capacity, it is only available *by state*, making a generalizable or comparable analysis across places difficult, if not impossible. (Our national analysis requires a degree of data uniformity that makes state-level administrative data challenging to work with. However, such data would significantly enhance a *single-state* analysis of childcare availability.) No data source that meets our criteria has data on costs. Given these constraints, we focus on measuring childcare availability based on the number of establishments as a *proxy* for capacity. Establishments are reliably available across data sources, across geography, and over time, making it a reasonable focal unit in absence of ideal data.

The data available that meets our criteria also determines the focal spatial unit. For most data sources, the smallest unit available is the county. Counties are also the smallest unit that can reliably be matched with other data sources to analyze the possible socioeconomic drivers of the childcare shortage. That said, two of our data sources offer data at the establishment level, which we exploit in part of our analysis to add dimension to the definition of a shortage. We consider these data sources nationally and in the context of two comparable communities—Garvin County, Oklahoma and Vernon County, Wisconsin—to demonstrate their ability to provide local insights.

QUARTERLY CENSUS OF EMPLOYMENT AND WAGES

The Quarterly Census of Employment and Wages (QCEW) is a dataset produced by the Bureau of Labor Statistics containing the count of establishments, jobs, and wages at the county, statistical area, state, and national levels. The data is aggregated by industry, allowing users to track the growth and contraction of sectors over time.

As with many publicly available datasets, users may encounter data suppression in the case of smaller geographies; for sectors in less populated counties, the true count of jobs and wages is often hidden from the dataset. However, the QCEW does not suppress the *number of establishments* by county for any NAICS sector, making it possible to at least track the number of businesses in the sector over time. The blue series in Figure 1 illustrates this number from 2001 to 2021 using the QCEW's establishment count for the "child care services" industry.

While the figure shows a relatively steady number of establishments throughout the observed time period—perhaps contradicting the narrative of a shortage—this is likely due to the QCEW's limited scope of only establishments with paid employees. In general, only between 20% and 30% of businesses have paid employees, meaning the vast majority of small businesses are not included (Bureau of Labor Statistics, 2017). Many childcare establishments are "non-employer" establishments (i.e., has no paid employees but earns over $1,000 a year and is subject to federal income taxes), leading to a systematic omission of the industry in terms of establishment counts.

At the local level, the QCEW data shows local variation in the trend (see Figure 2). In Garvin County, the number of childcare establishments declined from a peak of eight establishments to just three establishments as of 2021. (Garvin County also demonstrates the issue of suppression. For 2002 and 2003 the data is suppressed, so the number of establishments cannot be reported with accuracy, highlighting a limitation of the data.) In Vernon County, childcare establishments increase slightly from four to six establishments as of 2021. In sum, the QCEW is reliable for capturing regional variation and reporting employer establishments in the childcare sector, but it is limited due to suppression and the exclusion of nonemployer establishments.

COUNTY BUSINESS PATTERNS AND NONEMPLOYER STATISTICS

Other administrative data sources exist that can address the QCEW's exclusion of nonemployer establishments. The annual County Business Patterns (CBP) data series aggregates economic data—number of establishments, employment totals, and annual payroll—by county and industry. CBP data can then be merged with another U.S. Census Bureau product, Nonemployer Statistics (NES), which provides aggregated county economic data for businesses with no paid employees. Together, the two data series provide a more complete picture of local industry trends than QCEW, but they are not without their flaws: CBP data also suppresses data for a large share of county-industry combinations to protect the confidentiality of business owners (Eckert et al., 2020), and NES is hampered by a 3- to 4-year delay in availability, which makes it nearly impossible to use NES to explore phenomena related to recent events (such as the nearly 4-year-old COVID pandemic). The tandem of CBP and NES might make for a robust examination of childcare establishment dynamics, but only (1) when the study period is more than 3 years old and (2) when the counties and industries of interest are of a sufficient size.

For the United States, Figure 1 shows that the number of establishments reported by the CBP data is generally comparable to that reported by QCEW. Yet, the majority

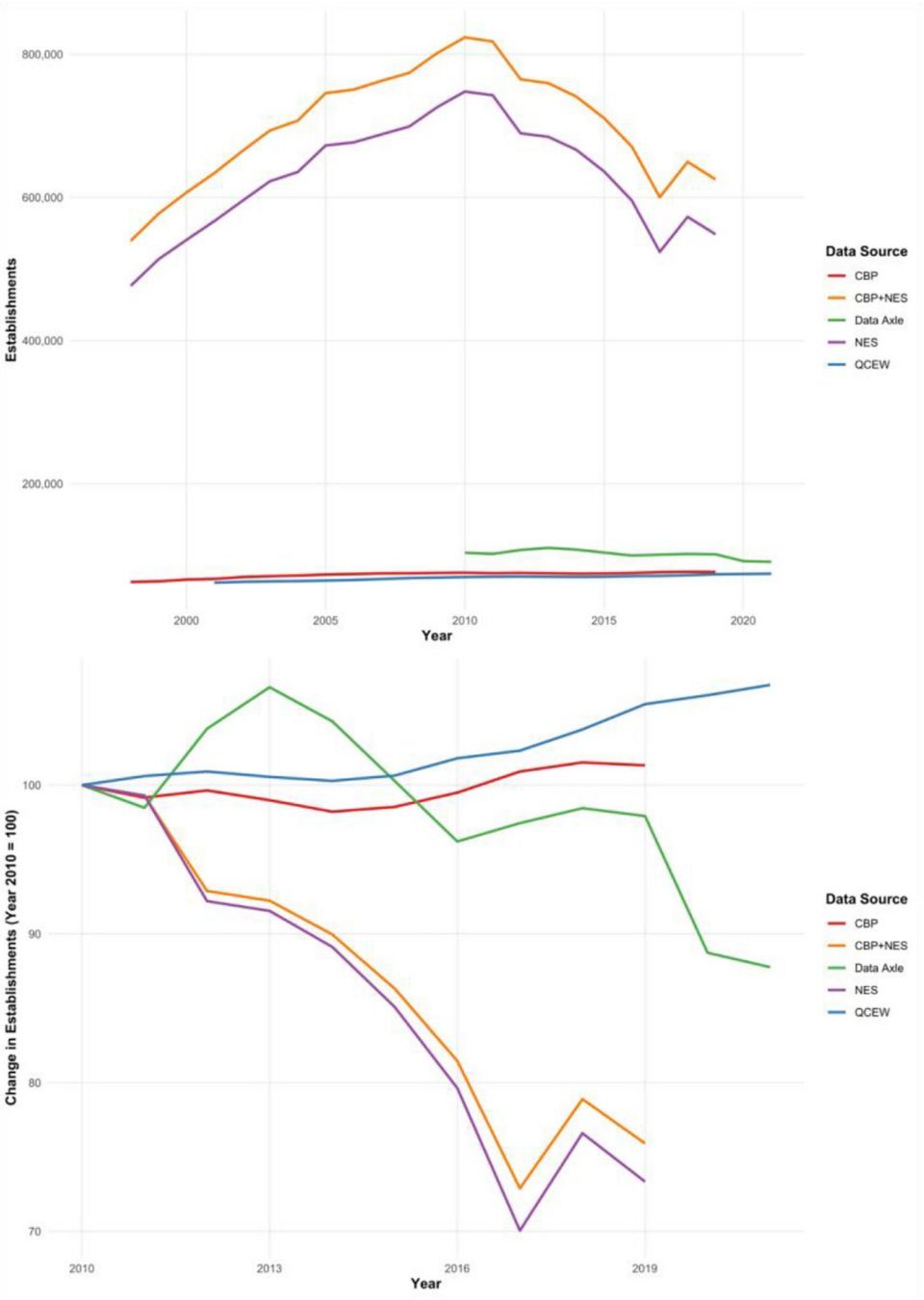

Figure 1. Dataset comparison of U.S. childcare establishment counts (top) and change (bottom) over time.

of childcare establishments are nonemployers, and these have been decreasing in number at least since the Great Recession. Using CPB and NES combined gives a more comprehensive picture of childcare establishments and the long-run decline. This trend is highlighted by Figure 2, which indexes growth since 2010 for each dataset. Only once incorporating nonemployer establishments do we see the decline.

While childcare counts based on the QCEW and CBP are comparable, it is more complete to combine CBP and NES data to get a total count of local establishments (see Figure 2, Panel B). The importance of tracking this data over time is also apparent: The decline in childcare establishments in Garvin County seemingly began well before the decline in Vernon County, suggesting that locations exhibit different patterns that may require a different strategic response.

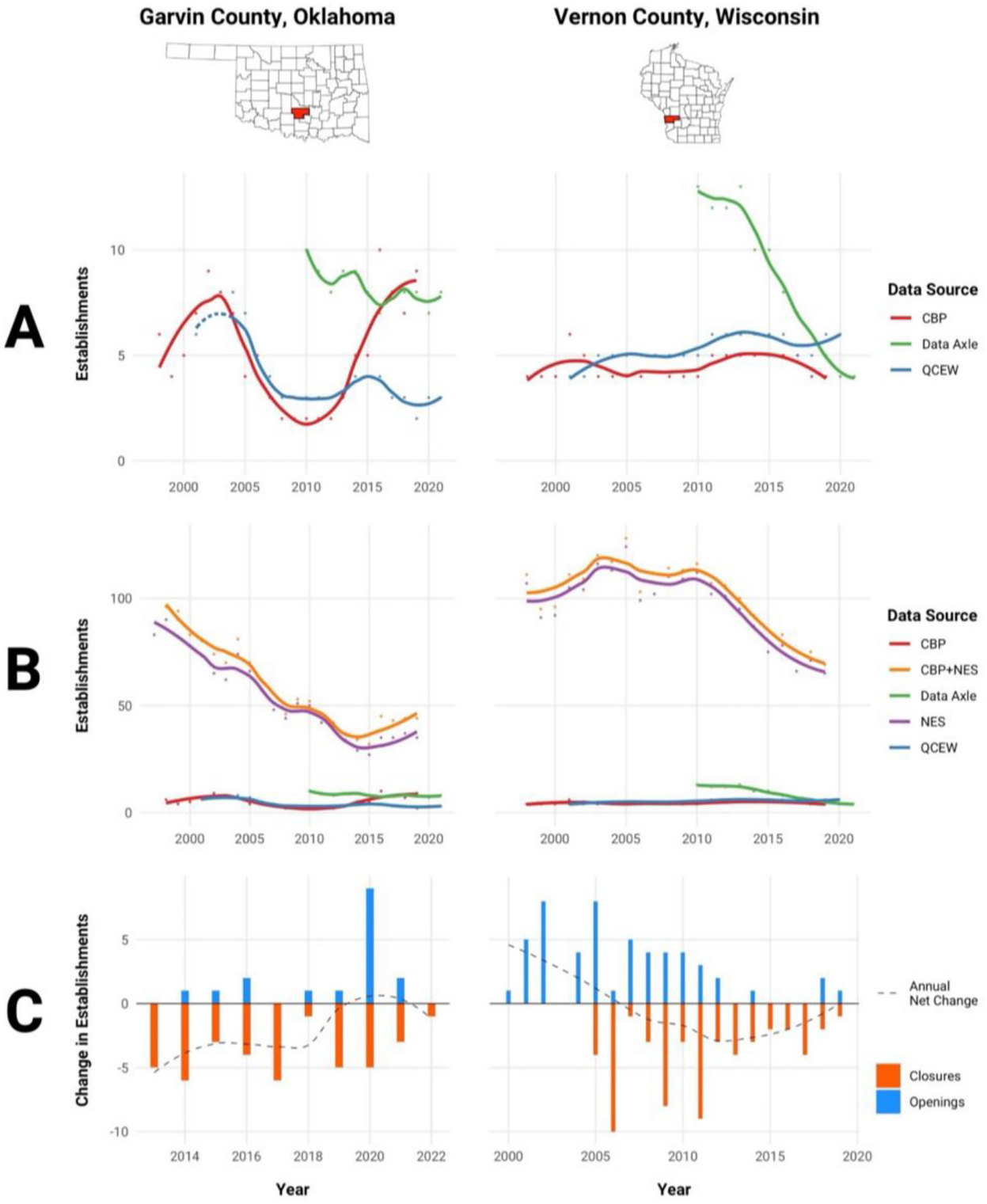

Figure 2. Dataset comparison of childcare establishment counts in two U.S. counties.

THIRD-PARTY BUSINESS ESTABLISHMENT DATABASES

As an alternative to the shortcomings of Federal data sources, third-party data is available from providers like Data Axle. As a private-sector entity, Data Axle is not subject to the same privacy regulations that public sector organizations must uphold, thus enabling it to create a completely unrestricted database of all business establishments. The authors are also familiar with the National Establishment Time-Series (see Deller & Conroy, 2017), which is another widely used third-party business establishment database. Though we do not

discuss it fully in this paper, its advantages and disadvantages are similar to those of Data Axle. Data was traditionally collected by telephone (Lavin, 2000), but modern collection involves a blend of web sources (e.g., digitized public records and search engines like Google Maps) and phone verification surveys (Data Axle Reference Solutions, 2020). This provides an unsuppressed source of longitudinal data that market analysts and researchers can leverage to track an industry, geographic area, or specific establishment over time.

One drawback of this data is that establishment counts can be noisy, particularly for smaller establishments and rural areas. In many such cases, Data Axle typically does not track granular fluctuation in total employment over time, but rather, businesses are shown as having a static employee count. While this reality eliminates the possibility of using Data Axle data for tracking establishment-level employment changes, it is nonetheless a useful resource when tracking establishments' presence over time.

Data Axle establishment counts often mirror the QCEW and CBP, but they also capture additional nonemployer establishments—perhaps those larger, more visible nonemployers with a web presence or other searchable records—omitted by QCEW and CBP. The Data Axle data also captures local variation as shown in Panel A of Figure 3. The decline in Vernon County, Wisconsin, is relatively steep and consistent, falling from above ten in 2010 to under five in the 2021 survey year. In Garvin County, Oklahoma, the number of childcare providers fluctuates slightly but still trends downward. For both counties, as with the national data, Data Axle generally reports more establishment than QCEW and CBP, but the pattern is less clear in more recent years.

STATEWIDE ADMINISTRATIVE DATA

Finally, those focusing on a particular state may opt to use administrative data from government entities—such as Oklahoma Child Care Services—which are able to collect and host data with a much higher level of granularity, often publishing detailed information at the establishment level (as opposed to aggregating by county). Unlike generic establishment-level data, statewide administrative data includes industry-specific variables, such as capacity and type (home- or center-based). As they are typically tied to specific licensing regulations, these datasets will also often include information about the history of the establishment, such as the year and month when it was first licensed and (if applicable) when its license may have lapsed or expired.

The key drawback with this option is that each state has its own system for collecting and publishing their childcare licensing data. Furthermore, unlike data products from the U.S. Census or Bureau of Labor Statistics, the primary user base of state licensing data consists of bureaucratic administrators, removing the need for their databases to be user-friendly for analysis and research. State administrative data can be cumbersome to use, with features and idiosyncrasies that add potential bias to research findings.

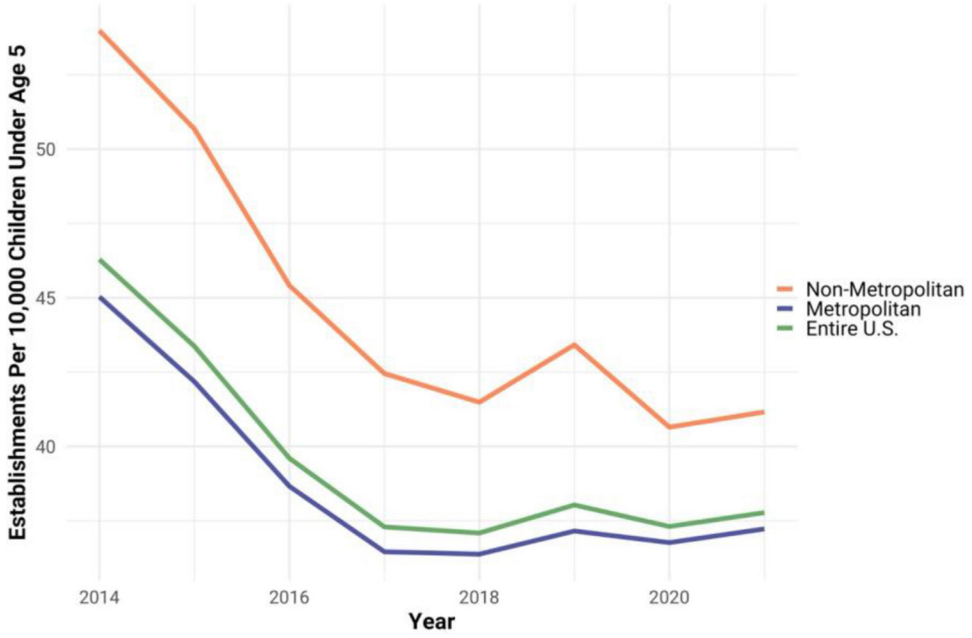

Figure 3. Childcare establishment count over time, by county type.

In Panel C of Figure 2, we show openings and closures of childcare establishments as well as the net change. Unlike with QCEW, CBP+NES, and Data Axle, the Oklahoma and Wisconsin statewide administrative data is presented as *events* (e.g., licenses awarded, licenses lapsed, and delinquency) rather than as an annual "census" of intact establishments. As such, the childcare sector is visualized in terms of net establishment licenses granted and/or revoked, rather than as a yearly count. With closures exceeding openings in these counties for most of the period, we would expect a general decline in the overall number of establishments (consistent with NES+CPB and Data Axle).

WEIGHING EACH DATA SOURCE

Of the four data sources reviewed above, none are fully able to capture the breadth and nuances of the childcare sector. Indeed, as noted by Warner (2006), "Data systems were not designed to count care work." However, each of the data options include significant advantages and limitations when used in an analytical context (summarized in Table 1).

As an all-purpose option, Data Axle has clear advantages due to its nationwide coverage, locational information, the detail on entry and exit of establishments, and the recency of the data. Due to data cost constraints, however, we focus on the years between 2014 and 2021, paying special attention to 2020 and 2021 due to their co-incidence with the COVID-19 pandemic. Though not perfectly aligned with other data sources (especially NES), we anticipate that trends observed in Data Axle childcare data are representative of the sector at large. To facilitate meaningful comparisons across localities in the United States and over time, we normalize all childcare establishment counts according to the population of children commonly requiring childcare, resulting in a measure of the *number of childcare establishments per 10,000 children under age five*.

TRENDS IN THE LOCAL AVAILABILITY OF CHILDCARE ESTABLISHMENTS

In this section, we use Data Axle historical business records to analyze trends in the availability of childcare establishments. We focus on trends over time, trends across spatial units, and patterns in the incidence of establishment entry and exit. We also use a regression model to identify the specific factors that may explain these trends.

TRENDS OVER TIME

Focusing first on the overall stock of childcare establishments in the United States over time, we observe a decline in the number of establishments per 10,000 children under age 5 (see Figure 3; Note that the y-axis origin in Figure 3 is at 30 establishments per capita, not zero). The exception to this trend is a spike, lasting from 2018 to 2019, but this was modest and short-lived. Most notably, the most rapid decline in childcare establishments occurred well before the pandemic. Interestingly, on a per-capita basis, the nonmetropolitan United States has more childcare establishments.

METROPOLITAN VS. NONMETROPOLITAN CHILDCARE AVAILABILITY

For all years of the study period, there are more establishments (per child under age 5) in nonmetropolitan counties than in metropolitan counties. Due to their lower population densities, it is unsurprising that rural areas would need to be served by a greater number of childcare establishments, as there are limits to the distances people will be willing to travel to use centrally located services. However, the decline in childcare establishment per capita was faster in rural nonmetropolitan counties than in metro areas. As a result, the gap in providers per capita narrowed over the time period.

Table 1. Characteristics of Childcare Establishment Data Options

	QCEW	Data Axle	CBP+NES	State Admin.
Availability	Publicly available	Proprietary	Publicly available	Varies by state
Coverage	All establishment with paid employees; small geographies subject to suppression	All active establishments; high variability for small geographies	All businesses filing payroll taxes; small geographies subject to suppression	Generally covers licensed and formerly licensed providers
Time Unit	Quarterly with 2-quarter delay	Annual with 6-month delay	Annual with 3-year delay	Potential for near real-time updates (varies by state)
Data Unit	County	Establishment	County	Establishment
Detail Level	Aggregated employment, wages, number of establishments	Varies by state (e.g., capacity, location, type of provider, and licenses)	Employment, payroll, legal form	Varies by state (e.g., capacity, location, type of provider, and licenses)

In 2010, the per-capita count for nonmetropolitan counties was over 16% larger than that of metropolitan counties; by 2021, the nonmetropolitan count was only 2.4% larger than the metropolitan count.

ACCOUNTING FOR DRIVING DISTANCE

We also used geographic information systems (GIS) mapping to examine the role of driving distance, a practical but often overlooked dimension of "local" childcare availability that has not been considered in many existing resources. Rather than confining households to a census block or tract, which may or not contain a childcare establishment, we use isochrone maps—which calculate the driving distance to a childcare provider within a given region—to analyze the total area accessible within a given driving time from existing childcare establishments (see Appendix A for more information). Overall, the isochrone maps (Figure 4) suggest that as the number of childcare providers decreases, people are forced to drive further to access childcare, and rural families bear a disproportionate burden from this shift. They can also be useful for considering the availability of care at the local level, adding a spatial dimension to the simple per-capita measure.

BUSINESS DYNAMICS: ENTRIES AND EXITS

To better understand the factors driving the childcare shortage, we first examine whether the recent decline in childcare establishments results from a decrease in the annual creation of new childcare businesses (entries) or an *increase* in the number of childcare businesses that fail (exits). The yearly shift in the count of childcare establishments reflects the balance between the influx of new establishments entering the market and the departure of "failed" establishments. For instance, a net change in +5 establishments may stem from five entries and zero closures, but it may also stem from 25 entries and 20 exits. Understanding the underlying dynamics can help diagnose local challenges. For example, are there barriers to entry preventing new providers from coming into the market or does a high rate of exit signal difficult market conditions once operating.

We used Data Axle business records to analyze childcare establishment entries and exits in U.S. counties between 2014 and 2021 (see Appendix B for more information). Disaggregating these business dynamics emphasized that the decline in childcare establishment entry rates far exceeded the increase in exit rates, suggesting that barriers to entry may be the more fundamental problem. Focusing on geographic patterns, shows wide regional variation in exit and entry rates among counties indicating that the drivers of these patterns may be specific to the local context.

To delve deeper, we used a regression analysis to model the relationship between childcare establishment dynamics (i.e., entry and exit) and factors related to childcare demand, household structure, socioeconomic characteristics, and the local policy environment (see Appendix C for more information). While the majority of the variables in our model were not statistically significant, we did observe a positive and statistically significant relationship between 2021 childcare establishment entries and the share of the population under age 5. We also found a positive association between childcare entries and the implementation of a childcare closure or capacity restriction policy during 2020. However, the model's low R^2 value (0.017) indicated that over 98% of the variation in childcare establishment entries was *not* explained by such factors.

This result suggests that supply-side impediments—rather than local demand-side factors—are likely playing a larger role in preventing childcare establishments from entering the market. Supply may be constrained by a wide range of factors that make it difficult to enter the market such as the regulatory environment, policy, and labor shortages and are likely the more effective targets for enhancing local childcare availability compared to demand-side changes such as cost.

IMPLICATIONS FOR EXTENSION

Given our findings above, Extension can respond with four primary educational strategies. First, given the limited research on childcare in local economic development that we observed

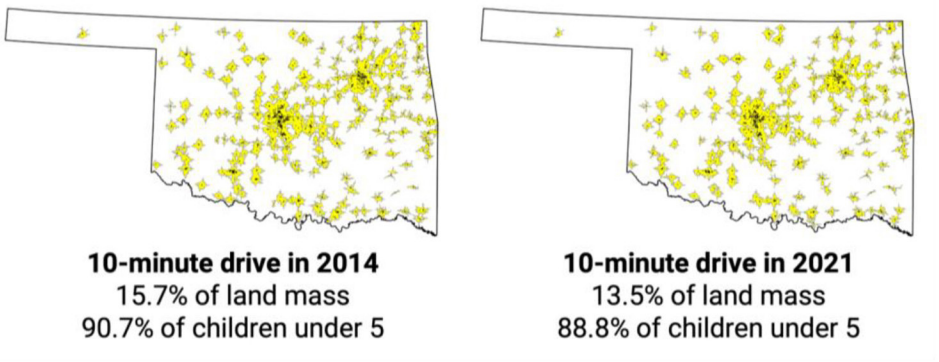

Figure 4. Drive time isochrone comparison: 2014 to 2021.

in the literature, communities may need help understanding the broader economic impacts of a childcare shortage and who the broader set of local stakeholders are. Second, given the limitations that we found across key datasets, communities may benefit from childcare data literacy training and how to use it to answer their questions on local childcare availability. Third, given that our analysis highlights the potential role of supply factors—as previously pointed out in the analysis of sector births and deaths and their driving factors—when communities choose to take on the challenge of childcare, they may benefit from education on the strategies that are likely to be most impactful. Last, Extension can support childcare providers with technical assistance that addresses key issues, such as the challenges for small nonemployer childcare businesses, as supported by the data.

CONNECTING CHILDCARE TO COMMUNITY DEVELOPMENT OUTCOMES

While childcare is generally understood to be important for children and families, its connection to broader economic outcomes is sometimes underappreciated. Most studies look at impacts only for individual women and children themselves (Cukrowska-Torzewska & Matysiak, 2020), with relatively few taking a community perspective (see Conroy, 2019; Herbst & Barnow, 2008; M. Warner et al., 2003; and Stolzenberg & Waite, 1984 for examples). As a result, communities may not see the value in childcare investments for the broader community and economy, nor be aware of all stakeholders. Extension specialists and educators can use research and education to demonstrate the relevance of a childcare shortage and identify the community stakeholders.

For example, research shows that childcare is associated with higher labor force participation rates, higher wages for women, and a smaller gender wage gap (Conroy et al., 2024). We've also found that childcare constraints force women into entrepreneurship (Conroy & Rupasingha, 2024). Several studies show increases in local labor force participation and cost savings for employers associated with childcare (e.g., Conroy, 2019; Herbst & Barnow, 2008; Stolzenberg & Waite, 1984; Belfield, 2019; Powell et al., 2019). This shows that women and the community at large, as well as children and industry professionals, stand to gain from a childcare solution. As wages increase, so do incomes, which is good for local economic growth, good for the tax base, and important for households. For employers facing a labor shortage, the labor force participation increase is especially valuable. In other words, the benefits go well beyond children and families, and Extension can educate communities on these benefits and include the appropriate stakeholders in addressing this issue.

CHILDCARE DATA LITERACY

Often for communities that have identified childcare as a local challenge, their first task is to quantify the extent of the shortage with data. Our research shows that the data vary in their usefulness in measuring different dimensions of the shortage. The most efficient way to proceed is often to start with publicly available data such as that available from the U.S. Census. Given the limitations on the timeliness of the data, communities may also explore proprietary data or their own primary data collection. Extension educators can help communities identify the best data source given their question and resource constraints.

For example, our work documents that for benchmarking local availability against other places for informing policy discussions, the QCEW combined with the County Business Patterns and Nonemployer Statistics is likely the fastest and cheapest source of data to approximate capacity as measured by the number of establishments. For near real-time approximations of the actual number of spots available from licensed providers to understand the extent of local demand, state administrative data is advantageous, though it is often more time-intensive to obtain and utilize. Propriety sources such as Data Axle may be the best compromise between expense, timeliness, and ease of use. Should none of these options adequately suit the needs of the community—for example, to identify childcare workforce needs—the best role for Extension may be in designing and supporting primary data collection via a survey or focus groups.

EDUCATION ON STRATEGIC INTERVENTIONS

If communities do have the goal of expanding access to childcare, it is important to understand the drivers of the childcare shortage, which we explored in Section 4.4. The childcare shortage is uniquely complex in that limited access is due to a suite of factors that we consider via regression analysis. Our analysis suggests that few demand-side factors explain the exit of childcare facilities. Instead, our results are consistent with childcare limitations due to the challenges providers face in finding workers and, perhaps for very small providers, the difficulty of navigating the regulatory environment. So, as communities consider whether to prioritize high costs for parents, limited availability, and operating expenses among other options, we encourage a thorough consideration of the local labor market conditions for the childcare workforce. With limited resources, programs to incentivize childcare workers and technical assistance to support providers, especially small providers, in meeting licensing and regulatory requirements are likely to have the largest impact.

TECHNICAL ASSISTANCE FOR PROVIDERS

Our results show that the large decline in childcare establishments is disproportionately due to a decreasing number of the very smallest providers. As our regression analysis shows, this decline is not likely due to demand-side issues but more likely due to operating barriers employer

themselves face. Indeed, the regulatory environment can be quite burdensome for a sole business owner and impede this form of childcare provision. Given these findings, Extension may have the most impact by focusing direct support for these small home-based and/or nonemployer providers with limited resources. Extension can provide technical assistance to these businesses that helps them build a stronger business. For example, in Wisconsin, the 2021 Wisconsin Childcare Business Initiative offered business development opportunities for existing and pre-venture childcare providers. The project, a collaboration between the Wisconsin Small Business Development Center (SBDC) and UW-Madison Division of Extension, aimed to improve or grow existing childcare business operations and help new owners chart their course to success. The program was further supported by the Wisconsin Early Childhood Association (WECA) and the nine Wisconsin Child Care Resource & Referral (CCR&R) Agencies to ensure that the program incorporated the appropriate industry expertise. The program was offered primarily online and reached over 600 participants with either existing childcare businesses or aspirations to open a business all across the state.

CONCLUSION

Our study delves into the challenges of childcare availability, emphasizing its critical role in shaping community-level economic outcomes. Beyond the direct impact that quality childcare can have on children through better outcomes in school and as young adults, childcare is essential for working parents and business owners. In the context of a labor shortage where employers are having difficulty finding employees, removing childcare as a barrier to employment is one way to expand the labor pool. Childcare has also been linked to higher earnings for women and a smaller gender earnings gap. Taken together, the benefits to children, families, workers, and employers make childcare an integral part of a strong community.

Given the importance of childcare, we assessed various datasets on childcare availability for their utility in community development work as well as examined trends and dynamics using Data Axle records. The analysis illustrates a significant decline in childcare providers in recent years, primarily driven by a lack of entries rather than an abundance of exits. In other words, the supply of childcare is constrained, as providers are either unable to enter the market or it is not profitable to do so.

This study helps lay the groundwork for communities seeking to address local shortages, offering guidance on leveraging data to address these challenges effectively. Extension professionals are instrumental in tackling this issue by: (1) connecting childcare to broader community development outcomes, (2) improving data literacy to quantify shortages and devise informed strategies, (3) analyzing trends to understand the root causes of childcare shortages, and (4) assisting childcare providers with direct support and technical assistance.

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APPENDIX A: ACCOUNTING FOR DRIVING DISTANCE IN THE CHILDCARE SHORTAGE

To enhance the existing methods of accounting for childcare availability, we employed geographic information systems (GIS) to examine the role of driving distance in accessing childcare. Driving a personal vehicle is the most commonly used mode of transportation to the workplace in the United States. Using data from the 2016–2020 5-year American Community Survey, the share of adults commuting to work via "car, truck, or van" is, on average, around 90% across all U.S. counties. As such, we ignore alternative transportation modes, such as walking or public transit, which are not representative of the typical household. Future childcare availability research may benefit from an evaluation of these alternative modes of transportation.

Using a series of isochrone maps, we visually represented the total area accessible within a given driving time from existing childcare establishments in Oklahoma and Wisconsin.

Isochrone areas, similar to spatial buffer zones, require both a time amount and transportation mode instead of a spatial distance value (e.g., 5 miles "as the crow flies"). We used the mapboxAPI R package (Walker, 2022) to generate isochrone areas around all Oklahoma and Wisconsin childcare establishments in 2014, with two time amounts of 10 and 20 minutes and the "driving" transportation mode. These isochrones provide a spatial representation of regions in a state within a 10- or 20-minute drive of a childcare center.

After generating each isochrone area, we combined the results with the 2010 block-level census population of children under age 5 (see Figure A1). In 2014, the spatial area within a 10-minute drive of a childcare establishment accounted for only 16% of Oklahoma's total land area and 31% of Wisconsin's land area. When the driving time threshold was increased to 20 minutes, these figures rose to 51% and 71%, respectively. In terms of individual access, the percentage of children under age 5 within a 10-minute drive of a childcare establishment was 91% in Oklahoma and 93% in Wisconsin. These percentages increased to 99.6% and 99.9%, respectively, when the driving time threshold was increased to 20 minutes.

To further investigate automobile access to childcare, we recalculated the 10-minute-drive isochrone area for Oklahoma in 2021. Comparing the 2014 and 2021 isochrone maps (see Figure 6 in the article text), the differences between them are modest, with a 1.9 percentage point reduction in the share of under-5 children with access to childcare within 10 minutes of driving. However, this small reduction still corresponds to more than 5,000 children, and over 60% of these children are located in rural areas. Importantly, the limitation of isochrone mapping is that it does not indicate if the nearest childcare establishment has capacity. A nearby but unavailable childcare center is no better than having no childcare provider at all for households in need of care.

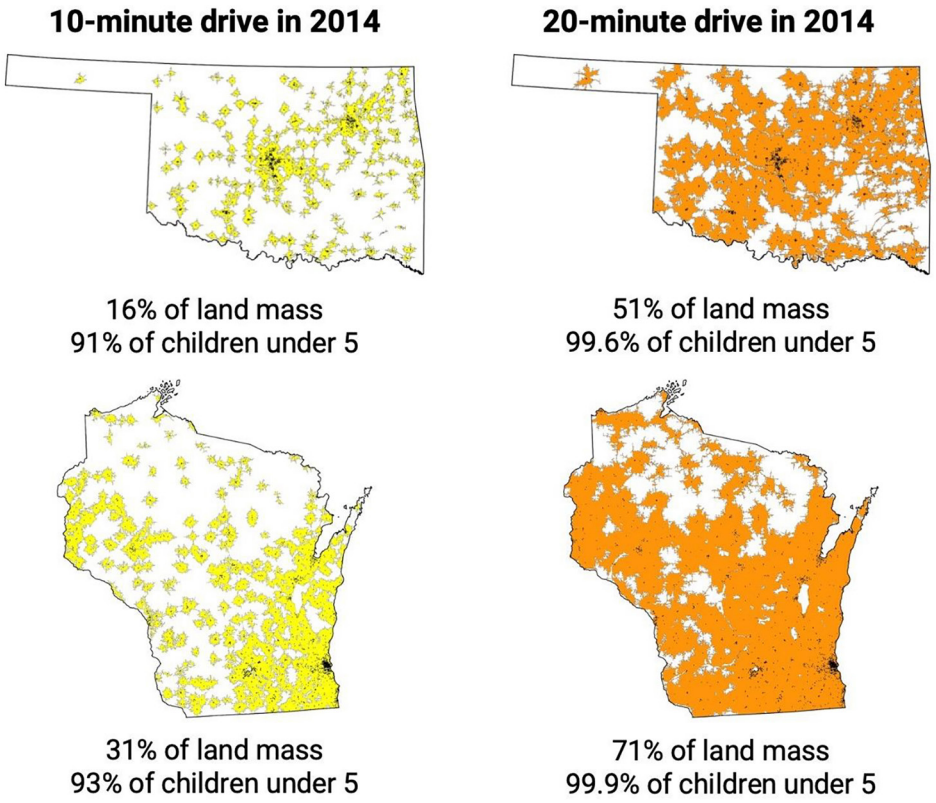

Figure a1. Drive time isochrone: nearest childcare establishment.

APPENDIX B: TRACKING CHILDCARE ESTABLISHMENT ENTRY AND EXIT

Each establishment in the Data Axle database is associated with a unique identifier code, allowing us to track its existence over time (and, in some cases, over different street addresses if the owners decide to relocate). We use these identifiers to observe when each establishment first entered the database and when they last appeared in the database. (Our Data Axle database ranged from 2014 to 2021. As such, those establishments that appeared in the first and/or last year of the dataset were not considered as either entering or exiting, respectively. Data Axle does include a column in their dataset which contains the "start year" for a particular business. However, a wide majority of entries in the dataset have missing values for the "start year" column, stripping its benefits as an analytical variable.) In the accompanying figures, the y-axis represents the number of exits and entries (both defined more precisely in the paragraphs below) as a percentage of the total childcare establishments for that given year.

For each year in Figure B1, an establishment was considered to be an *entry* if that given year was its first year to appear in the dataset. Between 2015 and 2019, entry rates appear to have fluctuated back and forth for both metropolitan and non-metropolitan counties, with nonmetropolitan counties consistently lagging behind metropolitan counties. From 2019 to 2021, the gap between metropolitan and nonmetropolitan became relatively small, with both county types declining sharply during the three-year stretch. Entry rates in 2021 (around five out of every 100 childcare establishments) were the lowest during the study period, having been reduced by around 75%–80% of their initial observed value.

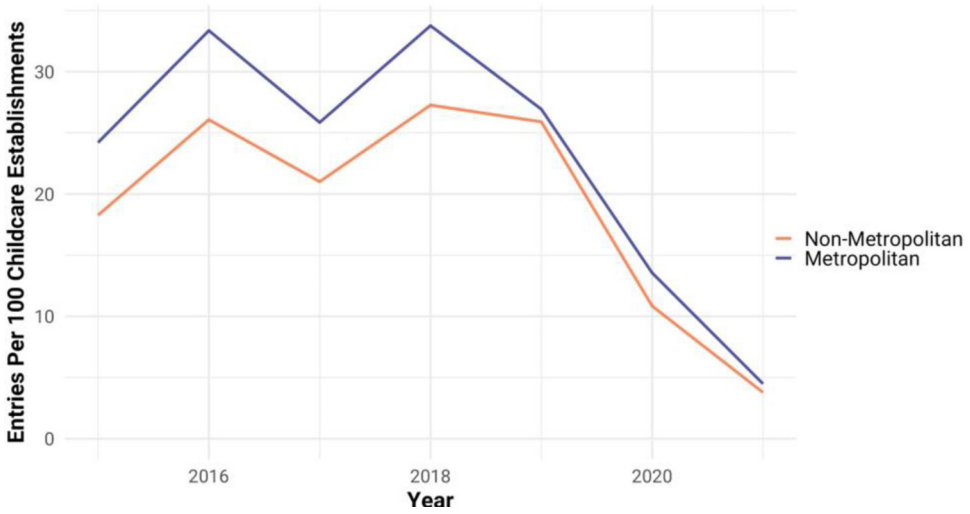

Figure b1. Childcare establishment entries over time, by county type.

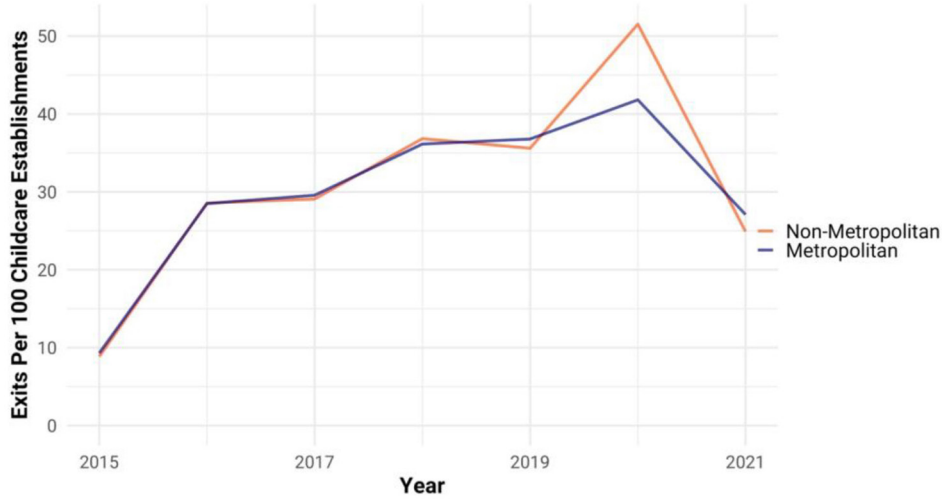

Figure b2. Childcare establishment exits over time, by county type.

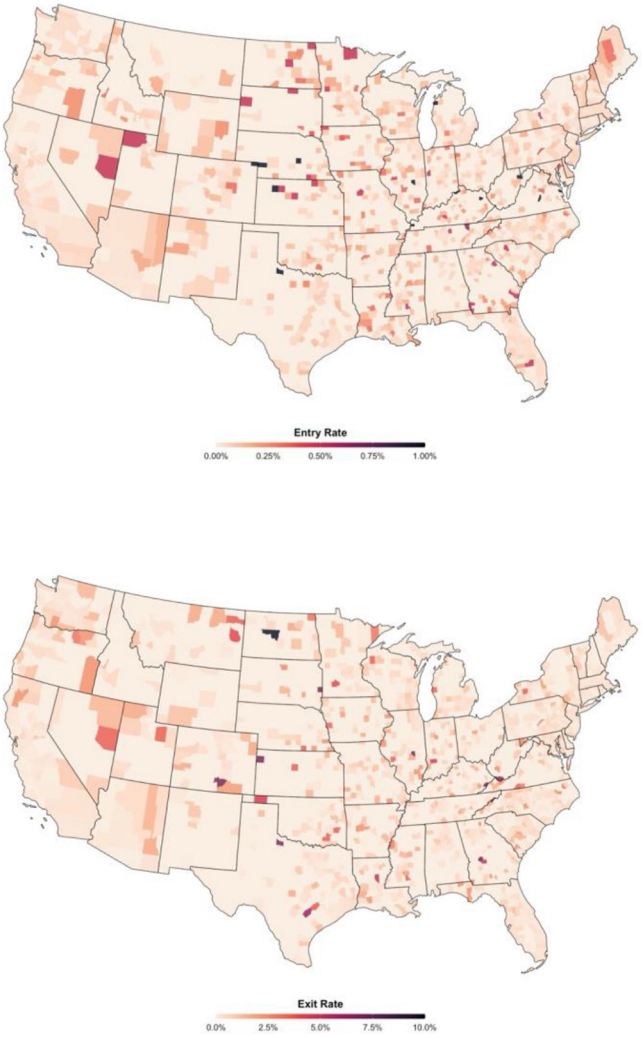

Figure b3. Post-COVID (2021) exit and entry rates in the continental United States.

An establishment is considered to be an *exit* (see Figure B2) during the first year in which it does *not* appear in the dataset. For example, an establishment that was in business from 2015 to 2019, then it is considered among the 2020 exits. As shown in the figure, annual exits in both metropolitan and nonmetropolitan areas followed roughly the same initial trend, experiencing a large spike in 2016, followed by a gradual increase over the next three years. However, exit rates diverged sharply between the two in 2020, with nonmetropolitan counties experiencing a much higher spike in business failures, reflecting providers that likely closed sometime during 2019. Exit rates in both county types once again converged in 2021. Together, these observations based on Figures B1 and B2 suggest that, during 2020, the first year of the pandemic (which is best reflected by the 2021 data), a decline in entry dominated an increase in exits to explain the net loss in childcare establishments.

Figures B1 and B2 illustrate how entry and exit rates varied over time, but the use of nationally aggregated data obscures any important spatial variation in childcare establishment dynamism across individual counties. To consider the potential impacts of the pandemic from another perspective, Figure B3 shows two maps that illustrate the respective 2021 entry and exit rates (which primarily reflect the 2020 administrative year) of childcare establishments across all counties in the continental United States. An initial glance at each map confirms the presence of strong spatial variation in exit and entry rates between counties. However, there are no immediately recognizable patterns that might explain this variation.

APPENDIX C: MODELING THE DETERMINANTS OF CHILDCARE ESTABLISHMENT ENTRY

Using county-level data (see Table C1 for summary statistics and Table C2 for variable descriptions), we ran a series of exploratory regression models to identify the spatial determinants of entry at the county level in recent years summarized as:

$$Y_i = \beta_0 + \beta_1 C_i + \beta_2 H_i + \beta_3 E_i + \beta_4 P_i + \epsilon_i$$

where Y_i is the entry rate of childcare establishments in county i (based on Data Axle's 2021 dataset). C_i is a vector of variables expected to be relevant to childcare demand, especially—if not exclusively—during the pandemic. As the ability to work from home may reduce the demand for childcare relative to work that requires in-person presence, we included the percent of households with broadband. We also account for the share of occupations that might be considered "white-collar" as these positions were more conducive to remote work.

H_i is a vector of households and the resident population features that impact demand. Women remain the primary care providers for children in most households. Thus, when women work outside the home the demand for childcare is likely to increase. We include the female labor force participation rate for women with children under 6, the share of the population under 5 years old (as a direct measure of the need for childcare providers), and the share of the population over age 65, as a population skewed older would have less need for childcare and (especially if grandparents play a role in providing informal care). E_i is a vector of economic variables, including median household income and the county unemployment rate. We expect that higher incomes increase the demand for childcare, and we expect higher unemployment to reduce both the ability to pay and the demand for childcare.

Finally, P_i is a vector that accounts for each county's policy environment during the COVID-19 pandemic. We include a measure of COVID mortality rates as an indicator of risk for households weighing whether to continue to send their children to childcare if available. It may also signal a region that had high levels of necessity workers that need care. Alternatively, COVID mortality rates could signal a relatively relaxed response to COVID at the local level which could correspond to relatively more demand for childcare and less stringent mitigation policies. Last, and perhaps most relevant, we include a variable to indicate whether a county is in a state that was subject to a childcare closure or capacity restriction policy during 2020 as reported by the Hunt Institute (2020).

Our results are reported in Table C3. We use state-level fixed effects to control for state characteristics that are expected to affect childcare but cannot be measured or included. First, it is important to note that the R^2 on our regression is very low, indicating that our model explains just

Table c1. Summary Statistics

	Mean	Std. Dev.	Min.	Max.
2021 Entry Rate	0.04	0.1	0	1
2021 Exit Rate	0.25	0.67	0	10
Share of Households with Broadband Access (%)	0.78	0.08	0	1
Female Labor Force Participation Rate, w/Children Under 6	0.7	0.13	0	1
Population Share Under Age 5 (%)	0.06	0.01	0	0
Population Share over Age 65 (%)	0.18	0.04	0	1
Share of Employment in White-Collar Sectors (%)	0.14	0.08	0	1
Median Household Income ($)	54832.28	14569.63	22292	147111
Unemployment Rate (%)	0.07	0.02	0	0
Peak 2020,Äì21 COVID Mortality Rate	2.52	7.66	0	223
Childcare Closure/Restriction Policy	0.27	0.44	0	1
County in a Metropolitan Area	0.37	0.48	0	1
	3221			

Table c2. Data Sources and Descriptions

Variable	Year(s)	Source	Additional Description (if needed)
2021 Entry Rate	2021	Data Axle	Number of 2021 entries divided by number of total childcare establishments
2021 Exit Rate	2021	Data Axle	Number of 2021 exits divided by number of total childcare establishments
Households with Broadband Access	2016–2020	ACS	
Female Labor Force Participation	2016–2020	ACS	Rate for women with children under 6
Population Share Under Age 5	2016–2020	ACS	
Population Share over Age 65	2016–2020	ACS	
White-Collar Employment	2016	Upjohn Institute	Uses the "WholeData" unsuppressed County Business Patterns dataset; comprises 2-digit NAICS codes 51–56
Median Household Income	2016–2020	ACS	
Unemployment Rate	2019	BLS	
Peak 2020–21 COVID Mortality Rate	2020–2021	NY Times	Uses 15-day moving average over the two years to identify peak rate
Childcare Closure/Restriction Policy	2020	Hunt Institute	Indicates whether state implemented childcare closure or capacity restriction policy during 2020
County in a Metropolitan Area	2013	OMB	Uses most recent core-based statistical area delineations

Table c3. OLS Regression Results

	(1)	(2)
Share of Households with Broadband Access	0.016 (0.033)	0.013 (0.034)
Share of Employment in White-Collar Sectors	0.004 (0.026)	0.002 (0.027)
Female Labor Force Participation Rate, w/Children Under 6	0.005 (0.018)	0.005 (0.018)
Population Share Under Age 5	0.580** (0.225)	0.588*** (0.225)
Population Share over Age 65	0.097 (0.070)	0.104 (0.070)
Unemployment Rate	-0.084 (0.111)	-0.091 (0.111)
Median Household Income	0.000 (0.000)	0.000 (0.000)
Peak 2020-2021 COVID Mortality Rate	0.000* (0.000)	0.000 (0.000)
Childcare Closure/Restriction Policy	0.024* (0.014)	0.026* (0.014)
County in a Metropolitan Area		0.003 (0.005)
Observations	3098	3095
R^2	0.016	0.017
State Fixed Effects	Yes	Yes

under 2% of the variation in childcare entry. This suggests that the supply of providers does not respond strongly to the range of demand factors that we considered. That said, there is some evidence that the share of the population under age five has the expected positive effect on childcare establishment entry. Interestingly, both peak COVID deaths and having had a closure policy also had a positive effect on childcare entry. This could be because peak COVID deaths are correlated with places with more necessity workers that required childcare. The positive effect of having had a closure policy could be explained by a rebound effect as establishments that previously closed reopened or the gap in care left due to policy-related closures eventually led to opportunities for new entry, though these effects would need further investigation.

However, the large majority of the variables are insignificant. The insignificant variables and poor fit of the model, reported by R^2, suggest that the demand factors considered have little effect on the entry of childcare establishments.