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Urbanicity and Access to Services for Individuals with Intellectual and Developmental Disabilities

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Abstract:	<p>Previous research suggests that residence in non-metropolitan areas is associated with lower access to preventative care and poorer health. However, this research has been largely restricted to the general population, despite data demonstrating disparities in health status and access to healthcare services for people with intellectual and developmental disabilities (IDD).</p> <p>The current study examined several hypotheses involving the effects of rurality on access to healthcare and services and health status: 1) individuals in non-metropolitan areas will have lower preventative healthcare utilization, 2) individuals in non-metropolitan areas will have poorer health outcomes, and 3) individuals in non-metropolitan areas will have poorer access to services. The current study uses data from the National Core Indicators (NCI) 2015-2016 Adult Consumer Survey, which included Rural-Urban Commuting Area (RUCA) codes for the first time. Results of logistic regression suggest that, despite connection to disability services, the health status and access to healthcare services of people with IDD generally follow patterns similar to those observed in the general population. Namely, people with IDD in non-metropolitan areas have decreased access to healthcare services, healthcare utilization, and health status. Despite some exceptions, it appears effects of rurality are not completely mitigated by current state and federal efforts.</p>

Urbanicity, Health, and Access to Services for Individuals with Intellectual Disability and
Developmental Disabilities

Abstract

Previous research suggests that residence in non-metropolitan areas is associated with lower access to preventive care and poorer health. However, this research has been largely restricted to the general population, despite data demonstrating disparities in health status and access to healthcare services for people with intellectual and developmental disabilities (IDD).

The current study examined several hypotheses involving the effects of rurality on access to preventive healthcare and services and health status: 1) individuals in non-metropolitan areas will have lower preventive healthcare utilization, 2) individuals in non-metropolitan areas will have poorer health outcomes, and 3) individuals in non-metropolitan areas will have poorer access to services. The current study uses data from the National Core Indicators (NCI) 2015-2016 Adult Consumer Survey, which included Rural-Urban Commuting Area codes for the first time. Results of logistic regression suggest that, despite connection to disability services, the health status and access to preventive healthcare services of people with IDD generally follow patterns similar to those observed in the general population. Namely, people with IDD in non-metropolitan areas have decreased access to healthcare services, preventive healthcare utilization, and health status. Despite some exceptions, it appears effects of rurality are not completely mitigated by current state and federal efforts.

Keywords: healthcare; intellectual disability; developmental disability; rural; support services

Urbanicity, Health and Access to Services for Individuals with Intellectual Disability and Developmental Disabilities

Article 25 of the 1948 United Nations Universal Declaration of Human Rights (United Nations, 1948) states that “everyone has the right to a standard of living adequate for the health and well-being of himself and of his family [...] and the right to security in the event of [...] disability [...]” This Article was later updated to specifically address the rights of individuals with disabilities (United Nations, 2006). Despite this, individuals with intellectual disability and/or development disabilities (IDD) continue to experience disparities in health care and service utilization as well as important markers of health such as diabetes (Anderson et al., 2013). In recognition of this disparity, in 2000, the Special Olympics released a commissioned report on the status of health care among people with IDD, noting barriers to services such as poor coordination of systems of care, lack of training for healthcare professionals, and lack of knowledge for caregivers (Horwitz et al., 2000). The US Surgeon General officially addressed the disparity in 2002 and again in 2005 with official reports from the U.S. Department of Health and Human Services bringing attention to specific health disparities experienced by people with IDD and calling for action to “close the gap” (U.S. Public Health Service, 2002; U.S. Public Health Service, 2005). He later noted that Healthy People 2010 largely excluded information on individuals with IDD and called for the establishment of national surveillance of health in the IDD population.

In their 2007 report, the Institute of Medicine reported that, despite some progress, there was still a need for growth in many areas, including access to care and services, coordination of care, and research on the intersection of environment, disability, and disease (Institute of

Medicine, 2007). Despite these calls to action, research has shown that health disparities and barriers to accessing healthcare services remain a real problem for individuals with IDD (Havercamp et al., 2004; Krahn & Fox, 2014; Maltais et al., 2020; Smith et al., 2019), and more quality research is needed regarding people with IDD and co-morbid chronic conditions (e.g., high blood pressure, high cholesterol, obesity, and cardiovascular disease) and the intersection of access to care, gender, race, socioeconomic status (SES), culture, and other environmental factors (Anderson et al., 2013).

With nearly 20% of Americans living in rural areas (Ratcliffe et al., 2016), understanding the impact of rurality on health and access to care is critical. The United States Department of Agriculture (USDA) has developed Rural-Urban Commuting Area Codes (RUCA) Codes to facilitate comparisons across a spectrum of rurality, measured by proximity to a metropolitan center and population density. People who live in rural areas tend to report both lower access to services—including healthcare—and poorer health and are more likely to forgo healthcare due to cost, regardless of disability status (Towne, 2017). Previous research has also found lower odds of access to preventive healthcare in rural populations as compared to urban populations (Krishna et al., 2010). Health risk factors also differ based on rurality, with rates of obesity being higher and percentage of smokers decreasing more slowly in rural areas than in urban areas (James & Cossman, 2017), which likely contributes to the shorter life expectancy observed in rural areas (Singh & Siahpush, 2014). There is little information on how this may or may not be different for individuals with IDD.

Despite organized efforts such as those by the National Health Service Corps—a loan repayment program for healthcare providers practicing in areas of high need—only 9% of

physicians practice in rural areas (Council of State Governments, 2011), whereas 19% of the population lives in rural areas (Ratcliffe et al., 2016). The Council of State Governments estimates that 49% of new physicians, 54% of new dentists, and 71% of new psychiatrists need to practice in non-metropolitan areas to meet recommended provider-to-population ratios. However, rural healthcare appears to be headed in the opposite direction as cuts to Medicare have resulted in rising amounts of rural hospital closures (Bauerlein, 2014). Shortages of healthcare professionals in rural areas increase the difficulty of finding and accessing a provider, especially for specialty care.

Transportation difficulties—already an important issue for individuals with IDD regardless of location (Scheer et al., 2016)—are a barrier to care for the general population in rural communities (Pesata, 1999). In rural areas, having a ride to medical appointments significantly improves frequency of care, and being able to drive independently improves it even further (Arcury et al., 2005). Geography's effects on outcomes for people with IDD within the U.S. have been compared within a single state (Havercamp et al., 2004), but not across United States Department of Agriculture (USDA) rural and urban designations nationally.

The influence of rurality on these outcomes can be difficult to separate from the effects of race and other confounding variables, especially when urban areas are more racially diverse (Caldwell et al, 2017), and over 80% of the growth in rural communities can be accounted for by minorities (Johnson, 2012). Research in the United States has demonstrated that minorities, especially African Americans and Hispanics, experience higher mortality rates, lower rates of some preventive healthcare screenings, and poorer overall health (Meltzer et al., 2005). Insurance coverage, important due to its connection to improved health outcomes, is also

correlated with race, even following implementation of the Affordable Care Act (Angier et al., 2017). However, fewer studies have examined the effects of race on these health-related variables in people with IDD, and, those that have, reported mixed results. Some have found results similar to those in the general population (Magana et al., 2016; Scott & Havercamp, 2015), with minorities experiencing decreased likelihood of having been to a dentist or primary care physician and—for African Americans only—increased likelihood of cancer screenings, others have found more equality in these variables between races than found in the general population (Bershadsky et al., 2014), and still others have found lower rates of cancer screenings among African American women (Parish et al., 2013). Studies that have attempted to make the distinction between the effects race and rurality have reported a somewhat mixed picture, although main effects of both race and rurality have been consistent (Caldwell et al., 2016) as do interactions between race and rurality (Bennett et al., 2012). More research is needed on the intersection of these variables in people with IDD.

For the purposes of this study, utilization of and access to preventive healthcare services were measured by the frequency and recency of visits to providers as well as routine preventive care such as flu vaccines, mammograms, and colorectal screenings. By most of these measures, individuals with disabilities continue to lag behind those without (Havercamp & Scott, 2015). Numerous factors have been suggested to drive this inequality, including difficulty finding providers and lack of professional training and sensitivity (Ward et al., 2010), physical inaccessibility (Mudrick et al., 2012), and cost (Centers for Disease Control and Prevention [CDC], 2010). Access to healthcare services is a variable of particular concern to people with IDD because of their increased likelihood of disease and injury, with people with multiple

disabilities experiencing the greatest disadvantage (Reichard et al., 2011). Risk factors such as tobacco use, obesity, and lack of physical activity are also more common in this population, further heightening the importance of health monitoring and access to health care and other services (Havercamp & Scott, 2015).

Health and healthcare are complex, and the influences on these variables are myriad. Among those with IDD, type of residence is a uniquely relevant variable as people with IDD not only live in the community, but also in residential and institutional settings. Deinstitutionalization of people with IDD brought concerns about the adequacy of community resources to fulfill the enhanced medical and support needs of this population (Garrard, 1982). Current research has suggested some basis for those concerns, finding that people with disabilities living in the community—alone or with family—are less likely to receive consistent health care such as preventive cancer screenings and routine doctor visits than those who live in residential or institutional settings (Freedman & Chassler, 2004; Scott & Havercamp, 2014).

The current study explored several hypotheses involving the effects of rurality on access to preventive healthcare and support services and health status, controlling for variables such as race, severity of ID, and type of residence: 1) individuals in non-metropolitan areas will have lower preventive healthcare utilization, 2) individuals in non-metropolitan areas will have poorer health outcomes, and 3) individuals in non-metropolitan areas will have poorer access to services. This research project received approval from The Ohio State University Institutional Review Board (IRB) as exempt since all data were archival and provided by Human Services Research Institute to the authors as de-identified data.

Methods

Sample

All participants were adults (18 years of age or older) with IDD receiving at least one service in addition to case management/service coordination from their state DD agency. The sample included 17,682 participants from 36 states, with a mean age of 42 years (SD = 15 years) and the following racial breakdown: 70% White, 18% Black/African American, 3% Hispanic, 7% Other, and 1% Unknown. All severity levels of ID were represented in the sample (38% mild, 30% moderate, 13% severe, 10% profound, and 9% unspecified), as were various co-morbid diagnoses (93% ID, 32% mood disorder, 25% anxiety disorder, 12% psychotic disorder, 30% behavior challenges, 16% autism spectrum disorder, 16% cerebral palsy, 4% brain injury, 29% seizure or neurological problem, 9% Down syndrome). 35% of the sample reported living in a parent/relative's home, 32% in a group residential setting, 20% in own home or apartment, 5% in intermediate care facility for people with ID (ICF/IID) nursing facility or other institutional setting, and 8% other (foster care, no home, etc.).

Procedure

Secondary data analysis was conducted using data from the National Core Indicators (NCI) Adult Consumer Survey—a collaborative effort between the National Association of State Directors of Developmental Disabilities Services (NASDDDS) and the Human Services Research Institute (HSRI) designed to measure outcomes in a standardized manner. The stability of data obtained from the NCI has been documented using a study of the test–retest reliability indicating 80% agreement levels between administrations and Kappa = 0.50 (Smith & Ashbaugh, 2001). Interrater reliability of the NCI Adult Consumer Survey has been evaluated multiple

times, with Kappa agreement percentages of .88 or above (NCI, 2012). The NCI dataset was provided following a request for data access for research purposes and IRB approval.

The NCI Adult Consumer Survey is comprised of pre-survey information, background information survey, Section I, Section II, and a surveyor feedback sheet. The pre-survey information is for surveyor use only and is not included in the report or analysis. The *Background Information section* is largely completed prior to the actual NCI interview by a case manager and other service providers using their knowledge of the individual as well as information obtained from the individual's case records. In some instances, there may be elements of the Background Information that is collected during the NCI face-to-face interview either by asking the adult being interviewed and/or their caregiver. The following data sources were reported as contributing to the Background Information Section (sources are not mutually exclusive): case manager (33.0%), other state staff (73.9%), contractor (82.1%), individual with IDD (82.1%), family member (88.3%), provider staff (84.0%), and other (90.1%). *Section I* is conducted via face-to-face survey with the individual receiving services and collects information about the individual's preferences, such as their satisfaction with services. They cannot be completed by a proxy. Surveys were excluded from analysis for Section I if the surveyor indicated that the individual receiving supports did not respond consistently to questions in Section I or if all answers to the Section I questions were either missing or marked as "N/A" or "Don't Know". *Section II* contains objective, fact-based questions that may be answered by either the individual receiving services or a proxy who knows them well. However, in order to avoid conflicts of interest and biased responses, neither case managers nor service coordinators may answer questions from Section II on behalf of the individual. All NCI data used in this study were drawn

from the Background Information section.

Variables

Predictor variables and covariates are rurality, race, and type of residence, all of which were measured on the Background Information section of the survey. **Rurality** is measured in the NCI Adult Consumer Survey using participant zip code data and the USDA's Rural-Urban Commuting Area (RUCA) codes that are based on the U.S. census tracts. These RUCA rurality designations (metropolitan, micropolitan, rural, small town, don't know) were the information used for analysis. Rural and small town were combined due to the necessarily low number of respondents in each category. **Race** is measured via race reported in case records. **Type of residence** as measured by the NCI Adult Consumer Survey falls broadly into the following categories: (a) Intermediate care facility for individuals with intellectual disability (ICF/IID) or other institutional setting, (b) community-based group residential setting, (c) individual home or apartment or parent's or relative's home, (d) foster care, (e) homeless, (f) other. Due to the relatively low number of individuals falling into the foster care and homeless categories, they were collapsed with "other" for analysis.

The outcome variables are access to services, preventive healthcare utilization, and health outcomes **Access to services** is measured in the Background Information section of the survey. The categories of services captured in the survey are service coordination/case management, respite or family support, transportation, job assistance, day services, education, health care coordination, dental care coordination, housing assistance, residential support, social or relationship, communication technology, environmental adaptations, benefits/insurance information, and other support services. **Preventive healthcare utilization** is comprised of 10

core health indicators in the Background Information section of the Adult Consumer Survey: have a primary care provider, physical exam in the past year, dental exam in the past year, eye exam in the past year, hearing test in the past five years, most recent Pap test (women only), most recent mammogram (women 40+ only), most recent colorectal cancer screening (50+ only), flu vaccine in the past year. Some of these variables, such as timing of most recent mammogram, were reported in the NCI database as categorical data (i.e., never had a mammogram, most recent mammogram within the past two years, most recent mammogram within past three years, most recent mammogram within past five years, most recent mammogram more than five years ago), and these categories were retained for data analysis. **Health outcomes** are entered on the Background Information section and include cardiovascular disease, diabetes, cancer, high blood pressure, and high cholesterol. Data on **ID diagnosis** and **severity level of ID** were also recorded on the Background Information section and are used as predictor variables.

Missing Data

Information on missing data for each variable is available from the NCI data reports on the 2015-16 survey (NCI, 2017). For descriptive analysis, pairwise deletion of missing data was used.

Regression Analysis

Logistic regressions were run to explore relationships between each of the predictor variables (rurality, race, and type of residence) and outcome variables. Analyses were separately run for each variable within the outcome categories (access to services, preventive healthcare utilization, and health outcomes) as there is no evidence that creating an overall score for each category is valid or meaningful. To the contrary, previous research suggests that variables within

these categories behave differently. All regressions were run using SPSS Statistics 25.

Logistic regression resulted in odds ratios, which were used to compare the relative odds of positive outcomes based on rurality designation, and χ^2 to assess model fit with urbanicity included. Specifically, it was predicted that non-metropolitan areas would have lower odds (OR < 1) of receiving preventive healthcare, higher odds of reporting more negative health outcomes such as diabetes (OR > 1), and lower odds of receiving all necessary services (OR < 1). Odds ratio analyses were completed using SPSS Statistics 25 and done separately for each variable within the outcome variable categories (preventive healthcare utilization, healthcare outcomes, and access to services) for the aforementioned reasons. Some logistic regressions were run with multiple reference variables in order to fully probe all sources of variance. Data were determined to meet statistical assumptions necessary to complete logistic regression, including size of dataset, categorical data, and independence of cases.

Results

Descriptive Statistics

After collapsing rural and small town, the sample was 64.9% metropolitan, 12.4% micropolitan, and 9% rural/small town. For ease of discussions, micropolitan and rural/small town are sometimes collectively referred to as non-metropolitan. Across levels of urbanization, groups were equivalent on gender and ID diagnosis (see *Table 1*). Individuals living in rural/small town areas were slightly older on average than those living in micropolitan areas, who were slightly older on average than those living in metropolitan areas ($F[2] = 15.102, p < .001$). However, this age difference was not clinically significant. Rural/small town areas had a higher percentage of Caucasian individuals than micropolitan or metropolitan areas ($F[2] = 14.785, p < .001$; *Table 2*). Severity of ID was not equivalent across urbanicity ($F[2] = 9.101, p < .001$; *Table 3*). Specific sources of variance were explored with logistic regression ($\chi^2[8] = 68.558, p < .001$; *Table 4*), and severity of ID was included as a control variable. Type of residence ($F[2] = 8.503, p < .001$; *Table 5*) was also statistically significantly different between the levels of urbanicity and, therefore, was also included as a control variable.

Logistic Regression

Research Hypothesis 1: Preventive Care Across Urbanicity

After controlling for type of residence, race, and severity level of ID, there were statistically significant differences between levels of urbanicity on pap test ($\chi^2[10] = 25.728, p = .005; n = 3,215$), flu vaccine ($\chi^2[2] = 8.652, p = .014; n = 7,876$), and physical exam ($\chi^2[2] = 17.003, p < .001; n = 10,631$). Compared to women with IDD living in metropolitan areas, women in rural/small town areas have statistically significantly higher odds of having had their most recent pap test 5 or more years ago versus never having had a pap test (OR = 1.546, $\beta =$

.436, $p = .017$, 95% CI [1.082, 2.208]). Compared to people living in metropolitan areas, people living in rural/small town areas have decreased odds of having their most recent pap test within the past year vs never (OR = .742, $\beta = -.299$, $p = .044$, 95% CI [.555, .992]). Compared to people with IDD living in a metropolitan area, those living in rural/small town areas have statistically significantly increased odds of having had a flu vaccine within the past 12 months (OR = 1.230, $\beta = .207$, $p = .013$, 95% CI [1.044, 1.448]). Compared to people with IDD living in a metropolitan area, those living in a micropolitan area have statistically significantly lower odds of having had their most recent physical exam within the past 12 months (OR = .729, $\beta = -.316$, $p < .001$, 95% CI [.627, .848]). Most recent dental exam ($\chi^2[4] = 3.875$, $p = .423$), primary care physician ($\chi^2[2] = 4.205$, $p = .122$), eye exam ($\chi^2[10] = 16.481$, $p = .087$), most recent mammogram ($\chi^2[10] = 6.013$, $p = .814$), and most recent colorectal scan ($\chi^2[10] = 10.896$, $p = .366$) were not statistically significant after controlling for race, type of residence, and severity of ID.

Research Hypothesis 2: Health Outcomes Across Urbanicity

After controlling for type of residence, race, and severity level of ID, compared to people with IDD living in metropolitan areas, those in rural/small town or micropolitan areas have statistically significantly higher odds of having diabetes ($\chi^2[2] = 29.764$, $\beta = .333$, $p < .001$; OR = 1.396, $p < .001$, 95% CI [1.183, 1.647]; OR = 1.402, $\beta = .338$, $p < .001$, 95% CI [1.214, 1.619]; $n = 10,411$). Compared to people with IDD living in metropolitan areas, those living in rural/small town areas have significantly higher odds of having high blood pressure ($\chi^2[2] = 20.442$, $p < .001$; OR = 1.354, $\beta = .303$, $p < .001$, 95% CI [1.187, 1.545]; $n = 10,371$). As compared to people with IDD living in metropolitan areas, those living in rural/small town and micropolitan areas have significantly higher odds of being obese ($\chi^2[6] = 35.110$, $p < .001$; OR = 1.375, $\beta = .318$, $p <$

.001, 95% CI [1.180, 1.602]; OR = 1.321, $\beta = .279$, $p < .001$, 95% CI [1.156, 1.511]).

Cardiovascular disease and high cholesterol were not statistically significant after controlling for these variables ($\chi^2[2] = 3.137$, $p = .208$; $\chi^2[2] = 5.098$, $p = .078$).

Research Hypothesis 3: Access to Services Across Urbanicity

After controlling for type of residence, race, and severity level of ID, the following services varied statistically significantly across urbanicity: transportation ($\chi^2[2] = 18.390$, $p < .001$), education/skills development ($\chi^2[2] = 20.522$, $p < .001$), healthcare coordination ($\chi^2[2] = 25.396$, $p < .001$), dental care coordination ($\chi^2[2] = 27.471$, $p < .001$), housing ($\chi^2[2] = 12.990$, $p = .002$), respite/family support ($\chi^2[2] = 11.796$, $p = .003$), social/relationship support ($\chi^2[2] = 20.348$, $p < .001$), residential support ($\chi^2[2] = 23.197$, $p < .001$), benefits/insurance information ($\chi^2[2] = 6.424$, $p = .040$), employment support ($\chi^2[2] = 10.474$, $p = .005$), and “other” supports ($\chi^2[2] = 7.475$, $p < .001$).

Compared to people with IDD living in metropolitan areas, people living in rural/small town or micropolitan areas are statistically significantly more likely to be receiving services related to transportation (OR = 1.278, $\beta = .246$, $p < .001$, 95% CI [1.120, 1.458]; OR = 1.173, $\beta = .160$, $p = .006$, 95% CI [1.046, 1.315]; $n = 10,616$), education/skills development (OR = 1.163, $\beta = .151$, $p = .012$, 95% CI [1.033, 1.309]; OR = 1.245, $\beta = .219$, $p < .001$, 95% CI [1.122, 1.380]; $n = 10,291$), healthcare coordination (OR = 1.263, $\beta = .234$, $p = .001$, 95% CI [1.106, 1.442]; OR = 1.800, $\beta = .246$, $p < .001$, 95% CI [1.139, 1.435]; $n = 10,048$), dental care coordination (OR = 1.249, $\beta = .222$, $p = .001$, 95% CI [1.095, 1.424]; OR = 1.304, $\beta = .266$, $p < .001$, 95% CI [1.163, 1.463]; $n = 9,939$), social/relationship support (OR = 1.283, $\beta = .249$, $p < .001$, 95% CI [1.134, 1.451]; OR = 1.162, $\beta = .150$, $p = .006$, 95% CI [1.044, 1.294]; $n = 9,800$).

People with IDD living in micropolitan areas are significantly more likely than those living in metropolitan areas to receive services related to housing (OR = 1.226, β = .204, p < .001, 95% CI [1.096, 1.372]; n = 9,947), residential support (OR = 1.364, β = .310, p < .001, 95% CI [1.199, 1.552]; n = 10,138), benefits/insurance information (OR = 1.153, β = .143, p = .011, 95% CI [1.033, 1.288]; n = 9,800), and “other” supports (OR = 1.208, β = .189, p = .012, 95% CI [1.041, 1.400]; n = 10,326).

Compared to people with IDD living in metropolitan areas, those living in micropolitan areas are less likely to be receiving respite/family support services (OR = .850, β = -.163, p = .010, 95% CI [.751, .962]; n = 10,350). Compared to people with IDD living in metropolitan areas, those living in rural/small town areas are significantly less likely to be receiving support services related to employment (OR = .849, β = -.164, p = .015, 95% CI [.744, .969]; n = 11,870).

Services related to care coordination ($\chi^2[2]$ = 3.658, p = .161), day services ($\chi^2[2]$ = 5.775, p = .056), communication technology ($\chi^2[2]$ = .368, p = .832), and environmental adaptations ($\chi^2[2]$ = 1.576, p = .455) were not statistically significant after controlling for race, type of residence, and severity level of ID.

Type of Residence by Urbanicity

After controlling for severity level of ID and race, people with IDD living in rural/small town areas were significantly more likely than those in metropolitan areas to live in a community-based group residence vs in their own or a family home (OR = 1.209, β = .190, p = .004, 95% CI [1.063, 1.375]; n = 13,980) and more likely to live in an “other” type of residence (e.g., foster care, homeless, etc.) than in their own or a family home (OR = 1.688, β = .134, p

< .001, 95% CI [1.399, 2.037]; $n = 13,980$) or in a community-based group residence (OR = 2.040, $\beta = .713$, $p < .001$, 95% CI [1.669, 2.493]; $n = 13,980$).

Discussion

While the effects of urbanicity on healthcare have been studied extensively in the general population, comparable previous research among people with IDD has been limited. The 2015-2016 round of NCI data collection was the first time zip code data were collected, allowing for comparisons of these variables across urbanicity in adults with IDD.

Our results indicated that people with IDD living in non-metropolitan areas were less likely to receive certain types of preventive healthcare (e.g., pap tests, yearly physicals) and experience poorer health outcomes and health markers (e.g., high blood pressure, high BMI), which was predicted based on previous data showing poorer access to preventive healthcare services for the general population living in more rural areas (Krishna et al., 2010). Yearly flu vaccination seemed to be an outlier, with people in non-metropolitan areas being more likely to have received a flu shot than those in metropolitan areas. This may be related to the relative ease of access to flu vaccines as they often do not require an appointment with a primary care physician. The general trend of lower access to preventive healthcare may be related to the higher risk of conditions such as high blood pressure and diabetes as better health care aids in management and treatment of these chronic conditions (Fritz, 2017).

Previous research has reported that people with IDD living in the community versus a more congregate care setting were less likely to have received certain preventive care services (Freedman & Chassler, 2004; Scott & Haverkamp, 2014). This finding may, in part, be due to the US Centers for Medicare and Medicaid Services (CMS) regulations, requirements, and oversight of ICF/IID and Medicaid-funded group homes that are designed to ensure appropriate

access to preventive healthcare. The current research suggested differences in type of residence based on urbanization, but the factor(s) associated with this difference in type of residence across urbanicity is/are unclear.

The current study also highlights differences in access to support services for people with IDD living in non-metropolitan areas. As compared to people with IDD living in metropolitan areas, people living in micropolitan and rural/small town areas are more likely to receive most types of support services. This suggests some level of acknowledgement of and attempt to address the increased needs of people with IDD living in non-metropolitan areas but does not appear to be enough to correct disparities in access to preventive care and health outcomes.

Implications

The results of the current study emphasize the need for additional action to address disparities in care for adults with IDD living in non-metropolitan areas. As lack of providers is a significant issue in rural areas and current initiatives to increase the number of rural providers do not appear to be sufficiently closing the gap, it is crucial that existing providers in these areas are willing and equipped to serve patients with IDD. Additional education for medical providers on serving patients with IDD and increased reimbursement rates for serving patients with IDD may help increase the number of providers willing to accept patients with IDD; however, this issue is complex. For example, previous research has demonstrated that higher Medicaid reimbursement fees are associated with higher rates of Medicaid acceptance by medical providers (Decker, 2012; Polsky et al., 2015), but the effects of previous attempts to increase Medicaid reimbursement have been attenuated due to delays in processing of reimbursement (Cunningham & O'Malley, 2009). Telemedicine is another option for addressing the lack of providers in rural areas. Previous research has demonstrated that this method of service can be

effective for increasing access to providers, including specialty providers, for people living in underserved areas, while maintaining quality of care (Hilty et al., 2013). However, it is worth noting that it is not a complete solution as it introduces additional barriers for rural clients such as poor internet access (Lee et al., 2015). While the costs of such initiatives may seem prohibitive, increasing access to care could decrease existing costs associated with untreated secondary health conditions and reduce emergency department visits (Cass et al., 2003).

Limitations and Future Directions

Secondary data analysis comes with inherent limitations (Johnston, 2017). Though protocols such as extensive interviewer training and reliability and validity checks are in place for NCI data (NCI, 2012), it is impossible to eliminate all sources of error. In regard to current variables of interest, it is possible that reliability of data may be different for metropolitan and non-metropolitan as number of case workers, as detail of records, and access to case records may vary with staff resources. Another limitation is data collection in the absence of specific research questions, which often leads to an emphasis on breadth rather than depth. In the case of the current research, data on socioeconomic status and level of education would contribute to a fuller picture of healthcare and service provision as these variables have been previously demonstrated to be associated with health outcomes (Agency for Healthcare Research and Quality, 2018).

The NCI database includes data from a random sample of people already receiving at least once service through their state DD agency. While targeting this population for sampling leads to high response rates, it does not capture people with IDD not connected with state services, who may differ on these measured variables. It is likely that the picture for people in non-metropolitan areas without this connection to services is even bleaker as they are less likely

to have supports such as health and dental care coordination and transportation to mitigate the effects of geography on access to care.

While controlling for race, IDD, and type of residence were necessary to examine the effects of rurality apart from these potential confounds, the use of control variables does raise questions about practical applications, as such a “pure” situation is unlikely to exist in reality. Therefore, it is important to interpret these results in context, with an understanding of the complex relationships that exist between rurality and the controlled variables (i.e., race, severity level of ID, and type of residence). In reality, these are not independent variables and likely interact in important ways to influence health and access to services. Factor analysis and structural equation modelling would be helpful to model the relationships between these variables and the effect of these relationships on the outcome variables. Adding predictor (i.e., control) variables also increases in risk of a Type I error. As the current research was primarily exploratory, no formal statistical corrections were made. However, many of the results would remain statistically significant after correction.

Context is also important when interpreting the results of logistic regression. Because odds ratios are unstandardized measures of effect size, some subjectivity is involved in deciding their practical significance (Ialongo, 2016; Szumilas, 2010). Because health is, as previously discussed, a complex outcome with many influencing variables, large odds ratios are not common or standard. This leaves some debate as to the practical relevance of “small” odds ratios. However, in general, the size of the odds ratios in the current research is comparable to other reported odds ratios in the field of health.

As the current study focused on urbanicity as the primary predictor of interest and used a nationwide sample, it is unknown how these results may apply to any particular state given the

variance in s. This research is intended to complement similar previous research conducted on the state level. Future research should focus on combining NCI and state-level Medicaid claims data to address specific questions related to inequities and barriers to healthcare services of individuals with IDD living in rural areas (see Havercamp et al., 2004).

Conclusions

Overall, the current research suggests that health outcomes and access to preventive care for people with IDD follow patterns similar to those observed in the general population, with a few outliers. Despite the sample being limited to individuals receiving at least one service through the state DD agency, there were still significant disparities observed in health and care based on level of urbanicity. This is in line with predictions but in contrast to the goals of federal and state disability organizations. While it is encouraging that some of the analyzed variables such as flu vaccines do not follow this general trend, in general, it appears that the effects of rurality on health and healthcare are too significant to be completely mitigated by current care coordination and service provision efforts.

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Table 1
Sample Demographic Information

	Gender (male)	Age	Diagnosed with ID (yes)
Rural/Small Town	310 (58.6%)	44.06 (15.970)	503 (95.8%)
Micropolitan	1245 (57.0%)	43.54 (15.534)	2077 (96.3%)
Metropolitan	6683 (58.4%)	42.00 (15.024)	10543 (94.2%)

Note: Gender and ID Diagnosis are presented as frequency (percentage). Age is presented as Mean (standard deviation).

Table 2*Descriptive Statistics for Race by Urbanicity*

	Rural/Small Town	Micropolitan	Metropolitan
American Indian or Alaska Native	13(2.5%)	58(2.7%)	91(0.8%)
Asian	0(0.0%)	8(0.4%)	163(1.5%)
Black or African American	55(10.5%)	303(14.2%)	2409(22.3%)
Pacific Islander	0(0.0%)	4(0.2%)	37(0.3%)
White	449(86.0%)	1741(81.4%)	7600(70.4%)
Hispanic/Latino	5(1.0%)	25(1.2%)	497(4.6%)

Note. Results are presented as frequency(percentage).

Table 3*Descriptive Statistics for Severity of ID by Urbanicity*

	Rural or Small Town	Micropolitan	Metropolitan
Mild ID	182(39.7%)	835(43.1%)	3842(40.8%)
Moderate ID	156(34.1%)	618(31.9%)	3099(32.9%)
Severe ID	69(15.1%)	248(12.8%)	1451(15.4%)
Profound ID	51(11.1%)	238(12.3%)	1016(10.8%)

Note. Results are presented as frequency(percentage).

Table 4*Logistic Regression for Severity of ID by Urbanicity*

		β	p	OR	95% CI for OR	
					Lower Bound	Upper Bound
Mild ID	Rural/Small Town	.206	.020	1.228*	1.033	1.461
	Micropolitan	.240	.002	1.272*	1.090	1.483
Moderate ID	Rural/Small Town	.092	.318	1.097	.915	1.314
	Micropolitan	.082	.059	1.167	.994	1.369
Profound ID	Rural/Small Town	.120	.304	1.127	.897	1.417
	Micropolitan	.315	.002	1.371*	1.128	1.666
Unspecified Level of ID	Rural/Small Town	-.441	.001	.643*	.492	.841
	Micropolitan	-.314	.007	.731*	.581	.919

Note: Urbanicity reference group is Metropolitan. Severity of ID reference group is Severe ID.
 * $p < .05$.

Table 5*Descriptive Statistics for Type of Residence by Urbanicity*

	Rural or Small Town	Micropolitan	Metropolitan
Intermediate Care Facility	35(6.6%)	133(6.1%)	583(5.2%)
Group Residential Facility	114(21.6%)	744(34.3%)	3536(31.3%)
Other (foster care, homeless)	91(17.3%)	164(7.6%)	784(6.9%)
Own Home	287(54.5%)	1128(52.0%)	6381(56.5%)

Note. Results are presented as frequency(percentage).