

Geographic Access to Behavioral Health Services after Reentry from the Washington State

Juvenile Justice System

Elaine Michelle Albertson

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Clarence Spigner

Sarah Veele

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Elaine Michelle Albertson

University of Washington

Abstract

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Elaine Michelle Albertson

Chair of the Supervisory Committee:

Clarence Spigner

Department of Health Services

Background: Youth confined in residential juvenile correctional facilities experience a high prevalence of mental health and substance use disorder relative to the general population. Access to behavioral health services after reentry to the community is important for preventing costly recidivism and promoting youth success. **Methods:** A geographic information system (GIS) was used to compare estimated youth reentry locations to behavioral health facility locations. Youth location data was compiled from Washington State administrative records (n = 950), and facility data was compiled from a state directory (n = 877). **Analysis:** Availability of behavioral health services was calculated as number of facilities within a 10-mile radius of estimated youth reentry location, and accessibility was calculated as shortest distance from youth to facility. **Results:** Maps and descriptive summary statistics indicate regions of low access to care for this youth population, particularly in rural regions of the state. **Implications:** The findings and methodological approach of this study may influence policy and practice in juvenile justice.

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1. Background

1.1. Youth Behavioral Health and Reentry

Since the early 21st century, a growing body of research has investigated the transition that youth committed in the juvenile justice system experience when returning to their home communities after completing their sentence. Often termed “reentry,” the shift from residential confinement to life in the community after release poses challenges to youth around maintaining continuity of health care and social services, meeting basic needs, reestablishing social relationships, and reengaging in education and employment (Altschuler & Amrstrong 2002; Sullivan, 2004).

Youth access to mental health and substance abuse treatment services, or behavioral health services, following reentry to the community constitutes an issue of public concern that extends beyond the juvenile justice system and into the realm of health policy. While the number of youth confined in juvenile residential placement declined by 54% between 2006 and 2015, nearly 50,000 youth remain in residential juvenile correctional facilities on any given day in the United States (United States Department of Justice, 2018). This population experiences high rates of mental health and substance use disorder, with prevalence estimates of approximately 50-80% (Golzari, Hunt, & Anoshiravani, 2006; Shufelt & Coccozza, 2006; Underwood & Washington, 2016). In Washington State Juvenile Rehabilitation facilities, an estimated 61% of youth had a mental health condition, and 57% of youth had a chemical use or dependency condition in 2016 (Washington State Department of Social and Health Services, 2016).

When youth behavioral health concerns are left untreated, public ethical as well as financial concerns can arise due to the causal relationship between youth behavioral health and costly

recidivism (Foster, Qaseem, & Connor, 2004; Justice Policy Institute, 2014; Schubert, Mulvey, & Glasheen, 2011; Yoder, Whitaker, & Quinn, 2017). To reduce recidivism and promote youth well-being, most juvenile justice systems in the United States, including Juvenile Rehabilitation in Washington State, have joined the system's growing "mental health movement" by providing on-site behavioral health services in facilities where youth are confined (Grisso, 2007). Standard facility-based services for youth confined in the juvenile justice system include screening and assessment, case management, mental health and substance use disorder treatment, and medication management (Desai et al., 2006).

At the same time, research indicates that community-based behavioral health services outside of the juvenile justice system may be more important than facility-based services in supporting youth success and preventing future juvenile justice system involvement. Published reviews of the literature suggest that interventions that address neighborhood and environmental factors hold promise for promoting youth success after reentry (Abrams & Snyder, 2010; Spencer & Jones-Walker, 2004; Lambie & Randell, 2013). One review concluded that community-based interventions implemented in the youth's "natural environment" were more effective than juvenile justice facility-based interventions in achieving positive outcomes for youth (Henggeler & Schoenwald, 2011). Another analysis highlighted the philosophical contradiction of providing behavioral health services in the "inherently unhealthy setting" of the juvenile justice system (Steinberg, Chung, & Little, 2004).

While the transition from residential confinement back into a community setting poses challenges for youth, it also offers opportunities for the juvenile justice system to assist youth in accessing and utilizing community-based behavioral health services (Altschuler & Brash, 2004). Despite growth in reentry services, utilization of behavioral health services after reentry remains

low relative to behavioral health need. Studies have estimated that between 8% and 31% of youth reentering the community after residential confinement in the juvenile justice system utilize mental health services within 3 to 24 months after reentry, and that between 10% and 37% utilize substance abuse services (Aalsma, Tong, Lane, Katz, & Rosenman, 2012; Cusick, Goerge, & Bell, 2008; Teplin, Abram, McClelland, Washburn, & Pikus, 2005; Trupin, Turner, Stewart, & Wood, 2004; White, Lau, & Aalsma, 2016). Although these utilization estimates vary depending on study population and length of follow-up, all fall well below the estimated 50-80% prevalence of behavioral health conditions in this population (Golzari, Hunt, & Anoshiravani, 2006; Shufelt & Cocozza, 2006; Underwood & Washington, 2016). There remains a need to investigate barriers that dissuade youth with behavioral health needs from utilizing relevant services after reentry from the juvenile justice system.

1.2. Geography and Access to Services

Theory suggests that the discrepancy between youth behavioral health need and “realized access,” or utilization after reentry, can be explained by limitations on “potential access” to services (Bissonnette, Wilson, Bell, & Shah, 2012; Davidson, Andersen, Wyn, & Brown, 2004). While definitions of health services access vary (Khan & Bhardwaj, 1994), theoretical work from the late twentieth century provides a foundational definition of access as “the potential and actual entry of a given population group to the health care delivery system” (Aday & Andersen, 1981, p. 5-6). Access can be characterized as a combined result of community characteristics, such as number and capacity of services in the community, and individual characteristics, such as feelings of stigma and health insurance enrollment status (Davidson, Andersen, Wyn, & Brown, 2004).

There remains a need to evaluate geographic factors, or community-level environmental factors, that affect youth access to and utilization of behavioral health services after reentry from the juvenile justice system. Research on youth reentry has largely focused on individual-level factors, including youth history of criminal involvement, education, supportive program participation, disability status, mental health status, family support, and social relationships (Abrams, Shannon, & Sangalang, 2008; Bullis, Yovanoff, Mueller, & Havel, 2002; Heilbrun et al., 2000; Sullivan 2004). By contrast, research on geographic barriers to accessing services after reentry is more limited, has largely focused on cities, rather than entire states, and has mainly pertained to adults reentering the community following confinement in correctional facilities, rather than youth (Abrams & Freisthler, 2010; Kubrin & Stewart, 2006; Visher & Farrell, 2005; Mellow, Schlager, & Caplan, 2008). Because many juvenile justice agencies, such as Washington State Juvenile Rehabilitation, operate outside of the scope of any one municipality, additional analysis is needed to inform state-level decisions regarding services for youth reentering after confinement in juvenile correctional facilities.

Spatial analysis of population and service locations can be conducted at any scale, including at the state level, and provides one lens for evaluating the influence of geographic factors on youth success. Health services research defines geographic access to care as a combination of two of the five dimensions outlined by Penchansky & Thomas (1981): availability, or provider adequacy in a region; and accessibility, or time and distance to travel to providers (Fortney, Rost, & Warren, 2000). Unlike many individual-level factors that influence access to services, geographic access “is an important determinant of treatment seeking behavior which can potentially be effected by public policy” (Fortney, Rost, & Warren, 2000, p. 174). Spatial analysis of service locations relative to population need can inform evidence-based policy development by

exposing interrelations between risk factors at the individual and environmental levels (Dummer, 2008), and by translating complex data into a comprehensible format for nonexperts including policymakers (Phillips, Kinman, Schnitzer, Lindbloom, & Ewigman, 2000).

Given the high prevalence of behavioral health conditions among youth reentering the community after confinement in residential juvenile justice facilities, an opportunity exists to apply measures of geographic access to understand the behavioral health service environments into which youth are reentering. Several studies have demonstrated the utility of geographic information systems (GIS) in analyzing behavioral health services availability and accessibility for populations involved in the social welfare system (Allard, Tolman, & Rosen, 2003; Mandayam & Joosten, 2016; Mellow, Schlager, & Caplan, 2008; Walker, Hurvitz, Leith, Rodriguez, & Endler, 2016). However, very little peer-reviewed research has quantified geographic access to behavioral health services for youth reentering the community after confinement in juvenile correctional facilities. One study of Los Angeles County found that ZIP Codes with a high youth reentry rate tended to have a low density of youth-focused behavioral health services, but that this association was not significant when community risk variables were included in the model (Abrams & Freisthler, 2010). However, this study only considered resource density, and did not consider shortest distance to resources, a measure that is commonly used to estimate geographic access to services (Allard, Tolman, & Rosen, 2003; Bamford et al., 1999; Bosanac, Parkinson, & Hall, 1976; Haynes, Bentham, Lovett, & Gale, 1999; Hewko, Smoyer-Tomic, & Hodgson, 2002; Metraux, Brusilovskiy, Prvu-Bettger, Wong, & Salzer, 2012; Rushton, 1999; Witten, Exeter, & Field, 2003; Smoyer-Tomic, Hewko, & Hodgson, 2004).

Measuring youth geographic access to behavioral health services after release from juvenile justice facilities is particularly relevant in Washington State where the state's executive

branch has prioritized youth reentry. In 2016, Washington State Executive Order 16-05 contributed momentum to the development of reentry-focused programs by naming “Successful Reentry” as a priority (Office of the Governor, 2016). In addition, the Washington State Juvenile Rehabilitation Reentry Team Meetings (RTM) program, a component of the Washington State Department of Social and Health Services (DSHS) Youth Reentry, Education, and Employment initiative, requires agency staff to navigate the availability and accessibility of community-based services for youth who are reentering the community after confinement in residential juvenile justice facilities (DSHS, 2017c). Spatial analysis of youth and behavioral health facility locations may thus directly inform policy and practice for the RTM program and other reentry-focused initiatives in Washington State.

2. Methods

2.1. Research Questions

This study compared the estimated locations of youth reentering the community after confinement in juvenile correctional facilities to the locations of mental health and substance use disorder treatment facilities registered in Washington State. Analysis was guided by the definition of geographic access as a combination of availability, measured as number of facilities within a set distance from youth; and accessibility, measured as shortest distance from youth to facility (Fortney, Rost, & Warren, 2000). Spatial methods were applied to answer three questions:

- 1. What are the geographic distributions of youth reentering the community after release from residential juvenile justice facilities, and of state-registered behavioral health facilities in the home communities of youth?**
- 2. Where are behavioral health facilities most and least *available* to youth reentering the community after confinement in residential correctional facilities?**
- 3. Where are behavioral health facilities most and least *accessible* to youth reentering the community after confinement in residential correctional facilities?**

2.2. Study Design

This study uses a descriptive cross-sectional design. Cross-sectional studies are observational, rather than experimental, and provide a “snapshot” of a population or phenomenon of interest at one point in time. This design is appropriate for answering applied policy research questions because it is relatively inexpensive, fast to implement, and can generate actionable information to inform service planning (Levin, 2006).

2.3. Data Sources

Youth Location: Youth data were drawn from preexisting administrative records provided by Washington State Juvenile Rehabilitation. This analysis included all youth released from Washington State Juvenile Rehabilitation institutions and community facilities in 2016 and 2017 (n = 1,048), with a release ZIP Code on file (n = 973), who were released to a Washington State ZIP Code (n = 950). For youth with multiple releases during this period, only the most recent release record was included to prevent duplication, and to take into account improvements in data quality over time.

Youth Behavioral Health Status: Youth behavioral health status was classified using data collected by Washington State Juvenile Rehabilitation staff in the agency's Integrated Treatment Assessment (ITA) form. This form is used to assess risk and protective factors for youth confined in Juvenile Rehabilitation facilities. Youth were classified as having a history of mental health disorder if they had a value of "Diagnosed with mental health problem(s)" for the field "History of mental health problems." The ITA defines mental health problems as including schizophrenia, bipolar, and mood, thought, personality, and adjustment disorders, confirmed by a professional in the social service/health care field; and as excluding conduct disorder, oppositional defiant disorder, substance abuse, and ADD/ADHD. Youth were classified as having a history of substance use disorder if they had a value of "Diagnosed as abuse" or "Diagnosed as dependent/addicted" for the field "History of referrals or alcohol/drug assessment."

Youth Demographics: Youth demographics were included in the administrative records provided for this project by Washington State Juvenile Rehabilitation.

Behavioral Health Facility Location: Mental health and substance use treatment facility data were drawn from the *Washington State Directory of Certified Mental Health, Substance Use Disorder, and Problem & Pathological Gambling Services* published in April 2018 (Washington State Department of Social and Health Services, 2018), and were spot-checked against behavioral health facility data published by the Substance Abuse and Mental Health Services Administration (Substance Abuse and Mental Health Services Administration, 2018). Of registered facilities in the state directory (n = 926), 49 facilities were excluded based on location confidentiality and services provided: 30 correctional facilities, 7 facilities with a confidential location, 7 facilities that focused exclusively on autism, 4 facilities that focused exclusively on pathological gambling, and 1 facility that was out-of-state. The remaining 877 facilities were included in analysis.

Behavioral Health Facility Type: Directory data provided both facility location and a summary of behavioral health services offered. Behavioral health facilities were classified as providing mental health services, substance use treatment services, or both mental health and substance use treatment services.

Geographic Boundaries and Populations: This analysis also incorporated publicly available county, ZIP Code Tabulation Area (ZCTA), and census block data published by the Washington State Office of Financial Management (Washington State Office of Financial Management, 2017). Files accessed included geographic boundaries in GIS shapefile format, and population data from the 2010 United States Census.

2.4. Software

Geographic analysis was conducted using R Version 3.4.3 using the *rgdal*, *sp*, *rgeos*, and *tmap* packages (Biand & Rundel, 2017; Bivand, Keitt, & Rowlingson, 2017; Pebesma 2018; Tennekes, 2018).

3. Analysis

3.1. Estimating Youth Reentry Location

As is common in health services research (Beyer, Saftlas, Wallis, Peek-Asa, & Rushton, 2011), exact addresses were not readily available for the youth population of interest. This analysis estimated the location in the community to which youth reentered using youth home ZIP Code, operationalized using United States Census ZIP Code Tabulation Area (ZCTA) boundaries.

One drawback of locating individuals based on their ZCTA is that aggregation error can arise from uneven distribution of the population across the area (Apparicio, Abdelmajd, & Shearmur, 2008; Beyer, Saftlas, Wallis, Peek-Asa, & Rushton, 2011). To account for aggregation error, this analysis estimated youth location in two ways. First, youth were geocoded to the Census-designated “internal point” of the ZCTA, which is the point inside the ZCTA that is located nearest to the ZCTA’s geographic center (United States Census Bureau, 2012). Second, youth were geocoded to the population-weighted center of the ZCTA. A “weighted mean center” method was used, analogous to calculating weighted mean values in a non-spatial context, to calculate the weighted average of census block internal point coordinates within each ZCTA, using the total population of each census block as weights (Berke & Shi, 2009; Chapman McGrew & Monroe, 2000). While unweighted centers tend to overestimate distance to health services, population-weighted centers have been shown to underestimate distances (Beyer, Saftlas, Wallis, Peek-Asa, & Rushton, 2011). It is thus anticipated that each youth’s true values for the availability and accessibility measures calculated for this analysis lie between the values calculated geocoding youth to the unweighted geographic center and to the population-weighted ZCTA center.

3.2. Calculating Availability of Behavioral Health Services

This analysis measured availability of behavioral health services as the number of state-registered behavioral health facilities within a 10-mile radius of the youth’s estimated reentry location. Studies of health care and social service availability have used values from 1.5 to 20 miles to represent a reasonable distance that a person might travel to seek services (Allard, Tolman, & Rosen, 2003; Fortney, Rost, & Warren, 2000; Walker et al., 2016). A 10-mile radius was selected for this study as the approximate mid-point of the range of values in the literature.

Calculating the number of services within a set distance of each study participant's location has been shown to be a useful measure of service availability, even when locations are estimated using ZIP Codes rather than exact addresses, as in this study (Fortney, Rost, & Warren, 2000). The availability measure was calculated at the individual level, and six variations were calculated for each youth (Table 1).

3.3. Calculating Accessibility of Behavioral Health Services

This analysis measured accessibility of behavioral health services as the shortest Euclidean distance, or straight-line distance “as the crow flies,” from the youth's estimated reentry location to the nearest behavioral health facility. While calculating distance along a network, such as roads, can improve accuracy of distance estimates (Shahid, Bertazzon, Knudtson, & Ghali, 2009), research indicates that the added precision from calculating distance along a network is limited (Boscoe, Henry, & Zdeb, 2012; Fortney, Rost, & Warren, 2000). For this reason, this study uses Euclidean distance rather than a more technically complex network-based approach. The accessibility measure was calculated at the individual level, and six variations were calculated for each youth (Table 1).

Table 1

Variations on Measures of Availability and Accessibility Calculated for Analysis

Measure	Estimated Youth Location in ZCTA	Facilities Included
Availability		
Measure 1	Geographic Center	Mental Health and Substance Use
Measure 2	Geographic Center	Mental Health
Measure 3	Geographic Center	Substance Use
Measure 4	Population-Weighted Center	Mental Health and Substance Use
Measure 5	Population-Weighted Center	Mental Health
Measure 6	Population-Weighted Center	Substance Use
Accessibility		
Measure 1	Geographic Center	Mental Health and Substance Use
Measure 2	Geographic Center	Mental Health
Measure 3	Geographic Center	Substance Use
Measure 4	Population-Weighted Center	Mental Health and Substance Use
Measure 5	Population-Weighted Center	Mental Health
Measure 6	Population-Weighted Center	Substance Use

3.4. Summarizing and Visualizing Youth, Facility, and Access Data

Data were summarized and visualized in three steps. First, youth demographics were summarized by behavioral health status to describe the study population. Second, youth and facility locations were visualized in descriptive maps, and were statistically summarized by two politically relevant geographies: 1) the three Washington State DSHS service regions (Washington State Department of Social and Health Services, 2011); 2) the nine Washington State Accountable Communities of Health regions (Washington State Health Care Authority, 2018). Third, service availability and accessibility were visualized in county-level maps, and were also summarized by DSHS service region and Accountable Community of Health.

4. Results

4.1. Overview of Study Population

Statistical analysis revealed that of the 1,048 youth released from Washington State Juvenile Rehabilitation in 2016 and 2017, 950 (90.6%) had a Washington State ZIP Code on file. Of these, 677 (71.2%) were classified in administrative records as having only a history of mental health diagnosis ($n = 150$), only a history of substance use diagnosis ($n = 272$), or both ($n = 255$). Approximately one third were age 18 or older at release, and over ninety percent identified as male (Table 2). Compared to all youth in the study sample, a higher percent of youth with a history of mental health diagnosis only were under 18 years old ($p = 0.001$), and identified as white alone ($p < 0.001$). Conversely, compared to all youth, a lower percent of youth with a history of substance

use diagnosis only were under 18 years old ($p = 0.024$), and a lower percent identified as white alone, although this difference was not significant ($p = 0.205$).

Table 2
Characteristics of the Study Population

Characteristic	All Youth	MH Diagnosis Only	SU Diagnosis Only	Both MH and SU Diagnosis	Neither MH nor SU
Population Size (N)	950	150	272	255	273
Age					
12 or Younger	0.5%	1.3%	0.0%	0.4%	0.7%
13-17	64.5%	78.0%	57.4%	63.1%	65.6%
18 or Older	34.9%	20.7%	42.6%	36.5%	33.7%
Gender					
Male	90.6%	94.0%	91.5%	85.9%	92.3%
Female	9.4%	6.0%	8.5%	14.1%	7.7%
Race					
American Indian and Alaska Native	4.4%	2.7%	6.3%	6.7%	1.5%
Asian	0.8%	0.7%	0.7%	0.8%	1.1%
Black or African American	18.5%	12.0%	20.6%	17.3%	21.2%
Hispanic or Latino	18.4%	10.0%	20.2%	12.5%	26.7%
Native Hawaiian and Other Pacific Islander	0.5%	1.3%	0.7%	0.0%	0.4%
White	40.5%	59.3%	36.0%	40.8%	34.4%
Mixed Race	15.3%	14.0%	14.7%	19.2%	12.8%
Unreported	1.5%	0.0%	0.7%	2.7%	1.8%

4.2. Geographic Distribution of Youth and Facilities

Descriptive maps and summary statistics were generated to answer Research Question 1, “What are the geographic distributions of youth reentering the community after release from residential juvenile justice facilities, and of state-registered behavioral health facilities in the home communities of youth?”

Visual analysis of maps indicated that youth with behavioral health conditions who reentered the community after confinement in residential juvenile correctional facilities were distributed across the state (Figure 1). Table 3 provides the distribution of youth by region. Compared to youth with a history of mental health diagnosis, youth with a history of substance use diagnosis were less likely to reenter in the western region of the state ($p = 0.017$).

It was also found that state-registered mental health and substance use treatment facilities were distributed across the state (Figure 1). More than 40% of facilities were in the urban Puget Sound region, and less than 25% of facilities were in the rural eastern region of the state (Table 4).

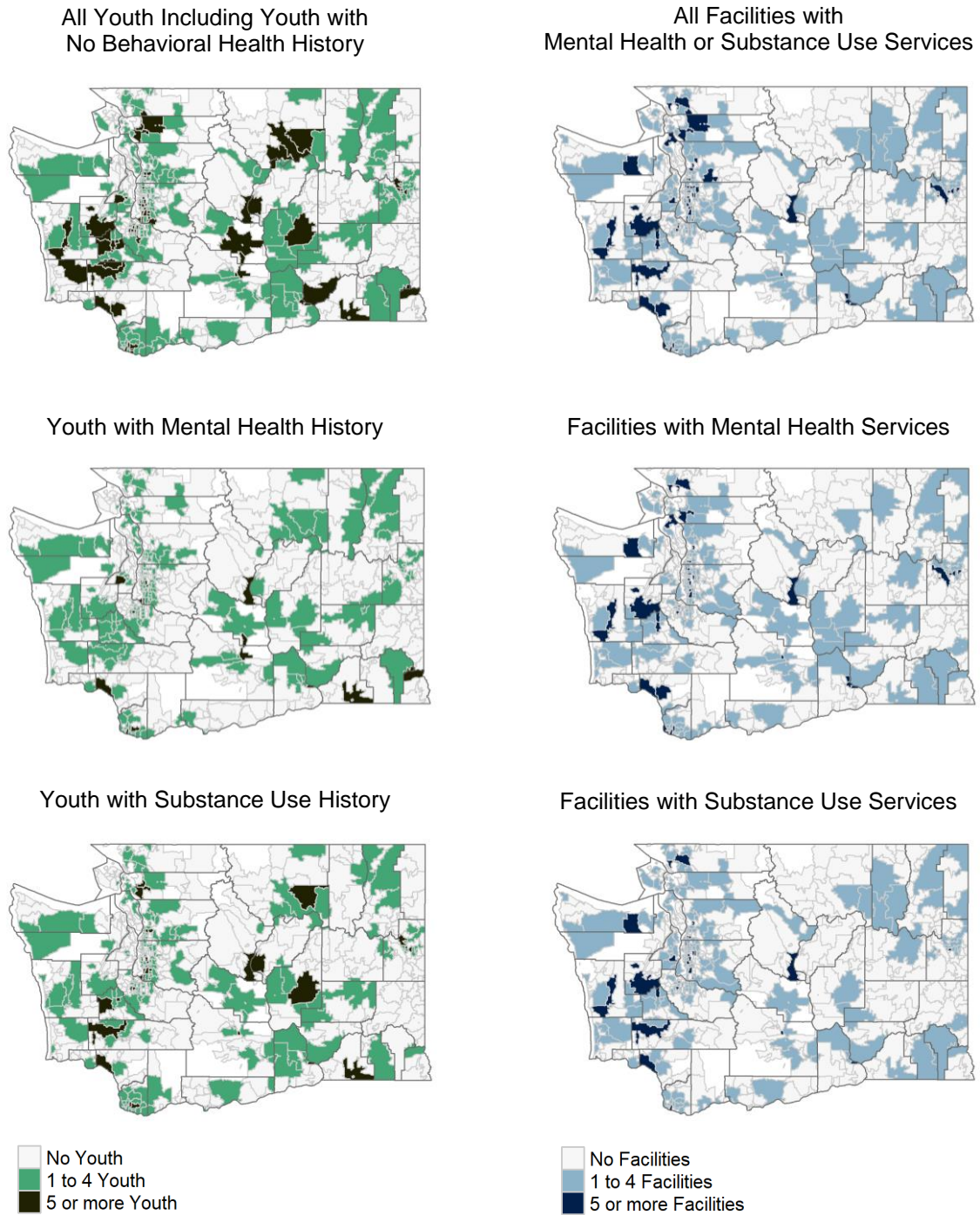


Figure 1. ZIP Code-level maps of number of youth reentering the community after confinement in Juvenile Rehabilitation in 2016 and 2017, and number of state-registered behavioral health facilities offering mental health and substance abuse treatment services in April 2018.

Table 3
Geographic Distribution of Study Population

Characteristic	All Youth (With or Without Diagnosis)	MH Diagnosis (Including Co-Occurring SU)	SU Diagnosis (Including Co-Occurring MH)
Population Size (N)	950	405	527
DSHS Region			
East (Region 1)	30.9%	28.4%	30.6%
Puget Sound (Region 2)	33.7%	32.6%	38.1%
West (Region 3)	35.4%	39.0%	31.3%
Accountable Community of Health (ACH)			
Better Health Together	8.5%	8.6%	9.1%
Cascade Pacific	13.5%	14.8%	12.1%
Greater Columbia	13.4%	12.1%	11.4%
King County	22.0%	22.2%	24.1%
North Central	8.7%	7.2%	9.7%
North Sound	11.7%	10.4%	14.0%
Olympic	3.5%	5.4%	2.3%
Pierce	10.2%	9.4%	7.8%
Southwest Washington	8.5%	9.9%	9.5%

Table 4
Geographic Distribution of Behavioral Health Facilities

Characteristic	All Facilities with MH or SU Services	Facilities with MH Services	Facilities with SU Services
Population Size (N)	877	611	550
DSHS Region			
East (Region 1)	23.0%	24.6%	23.3%
Puget Sound (Region 2)	43.6%	43.4%	42.9%
West (Region 3)	33.4%	32.1%	33.8%
Accountable Community of Health (ACH)			
Better Health Together	11.4%	12.6%	12.0%
Cascade Pacific	13.0%	12.8%	13.8%
Greater Columbia	8.7%	9.0%	8.7%
King County	27.1%	26.7%	27.8%
North Central	2.7%	2.6%	2.2%
North Sound	16.4%	16.7%	15.1%
Olympic	5.1%	3.6%	6.2%
Pierce	9.0%	8.8%	9.3%
Southwest Washington	6.5%	7.2%	4.9%

4.3. Availability of Behavioral Health Services

County-level choropleth maps and summary statistics by region were generated to answer Research Question 2, “Where are behavioral health facilities most and least *available* to youth reentering the community after confinement in residential correctional facilities?”

Availability of behavioral health services was measured as number of relevant behavioral health facilities within a 10-mile radius of estimated youth location. Visual mapping indicated that mean number of facilities within a 10-mile radius of youth varied across the state (Figure 2). Highest behavioral health service availability for this youth population was observed in the urban Puget Sound, Vancouver, and Spokane metropolitan areas, while lowest availability was observed in rural regions of the state.

Calculation of a Pearson correlation coefficient showed a very strong positive correlation between the unweighted and population-weighted facility availability variables ($r = 0.99$ for all youth, $r = 0.99$ for youth with a history of mental health diagnosis, and $r = 0.99$ for youth with a history of substance use diagnosis). On average, youth in the urban Puget Sound region had over twice as many facilities within a 10-mile radius as youth in the other two DSHS regions (Table 5).

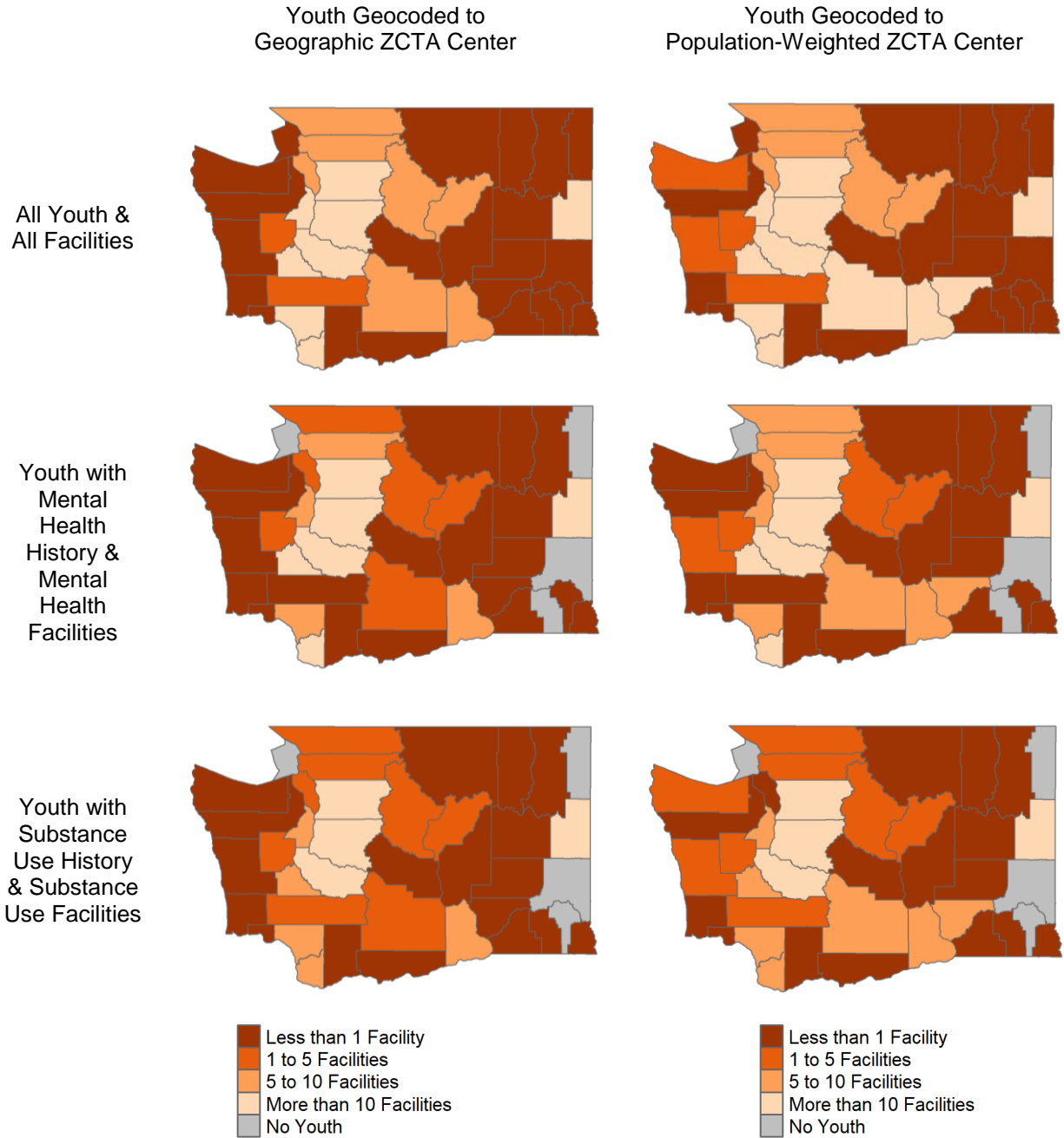


Figure 2. Mean number of facilities within 10 miles of youth, by county.

Table 5

Mean Number of Behavioral Health Facilities Within a 10-Mile Radius of Youth

Characteristic	All Youth (With or Without Diagnosis)		MH Diagnosis (Including Co-Occurring SU)		SU Diagnosis (Including Co- Occurring MH)	
	Location Where Youth Were Geocoded in ZCTA					
	Geographic Center	Weighted Center	Geographic Center	Weighted Center	Geographic Center	Weighted Center
All Washington State	44.4	46.2	30.1	32.8	31.1	28.8
DSHS Region						
East (Region 1)	20.3	23.2	16.5	19.7	17.0	14.7
Puget Sound (Region 2)	77.4	78.7	52.1	53.7	47.8	47.5
West (Region 3)	34.1	35.3	24.1	26.0	21.1	19.8
Accountable Community of Health (ACH)						
Better Health Together	54.2	56.7	42.3	47.4	38.3	35.7
Cascade Pacific	16.8	19.5	12.0	15.1	11.8	11.8
Greater Columbia	10.5	14.6	7.4	10.4	7.9	8.4
King County	99.9	100.6	68.1	68.3	62.8	62.7
North Central	5.3	5.6	3.5	4.3	3.8	3.0
North Sound	34.9	36.6	24.5	27.2	21.2	21.4
Olympic	10.7	14.2	6.0	8.1	14.3	9.7
Pierce	59.0	58.8	41.2	41.1	37.8	37.5
Southwest Washington	38.2	39.0	28.8	29.7	17.7	17.2

Note. Number of facilities within a 10-mile radius for all youth includes all facilities (n = 877). Number of facilities within a 10-mile radius for youth with a history of mental health diagnosis includes only facilities with mental health services (n = 611). Number of facilities within a 10-mile radius for youth with a history of substance use diagnosis includes only facilities with substance use services (n = 550).

4.4. Accessibility of Behavioral Health Services

County-level choropleth maps and summary statistics by region were generated to answer Research Question 3, “Where are behavioral health facilities most and least *accessible* to youth reentering the community after confinement in residential correctional facilities?”

Accessibility of behavioral health services was measured as shortest distance to a relevant behavioral health facility from the estimated youth location. Visual mapping indicated that mean shortest distance to a relevant behavioral health facility varied across the state (Figure 3). Highest behavioral health service accessibility for this youth population was observed in the urban Puget Sound, Vancouver, and Spokane metropolitan areas, while lowest accessibility was observed in rural regions of the state.

Calculation of a Pearson correlation coefficient showed a moderate-to-high positive correlation between the unweighted and population-weighted facility accessibility variables ($r = 0.69$ for all youth, $r = 0.76$ for youth with a history of mental health diagnosis, and $r = 0.76$ for youth with a history of substance use diagnosis). Mean shortest distance to a relevant behavioral health facility was highest in the urban Puget Sound region, followed by the western and eastern regions (Table 6).

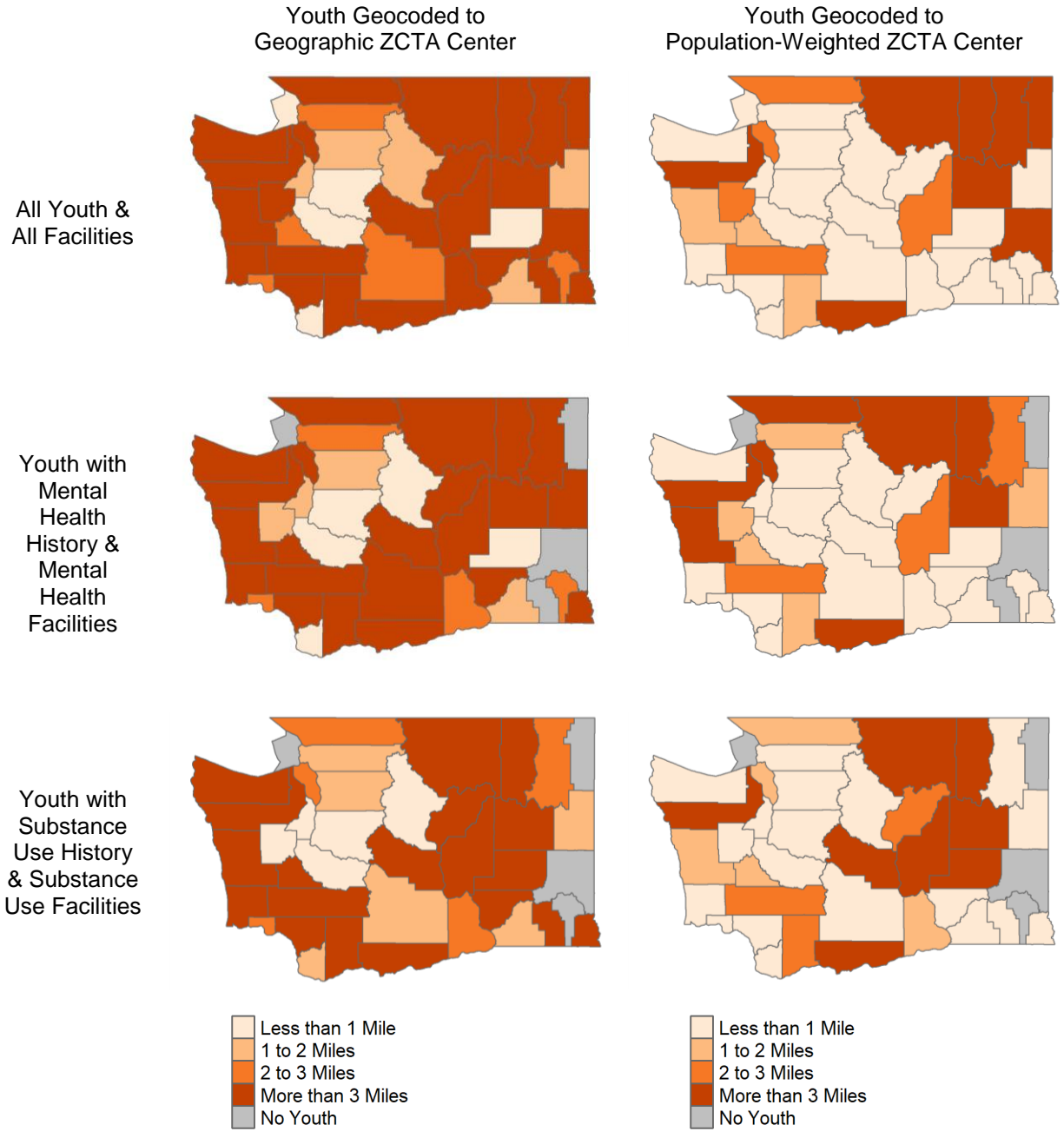


Figure 3. Mean shortest distance from youth to relevant facilities, by county.

Table 6

Mean Shortest Distance in Miles from Youth to Behavioral Health Facility

Characteristic	All Youth (With or Without Diagnosis)		MH Diagnosis (Including Co-Occurring SU)		SU Diagnosis (Including Co- Occurring MH)	
	Location Where Youth Were Geocoded in ZCTA					
	Geographic Center	Weighted Center	Geographic Center	Weighted Center	Geographic Center	Weighted Center
All Washington State	3.6	1.8	4.3	2.3	3.6	2.0
DSHS Region						
East (Region 1)	5.4	2.6	6.8	3.4	5.3	3.0
Puget Sound (Region 2)	1.7	1.1	2.0	1.5	1.9	1.3
West (Region 3)	3.7	1.8	4.5	2.3	4.0	1.9
Accountable Community of Health (ACH)						
Better Health Together	3.8	2.8	6.6	4.8	3.8	2.8
Cascade Pacific	6.0	2.5	7.1	3.5	6.0	2.4
Greater Columbia	5.3	1.3	5.9	1.2	4.7	1.6
King County	1.1	0.8	1.3	0.9	1.3	1.0
North Central	7.1	4.3	8.0	5.1	7.4	4.8
North Sound	2.9	1.9	3.5	2.7	2.8	1.9
Olympic	5.2	1.6	6.4	2.1	7.4	2.1
Pierce	1.4	1.4	1.3	1.3	1.3	1.2
Southwest Washington	2.6	1.5	3.0	1.8	3.1	2.0

Note. Mean shortest distance for all youth includes all facilities (n = 877). Mean shortest distance for youth with a history of mental health diagnosis includes only facilities with mental health services (n = 611). Mean shortest distance for youth with a history of substance use diagnosis includes only facilities with substance use services (n = 550).

5. Discussion

Maps and summary statistics revealed hot spots where large numbers of youth were released from Washington State Juvenile Rehabilitation in 2016 and 2017, as well as locations where this population had low geographic access to care after reentry to the community based on measures of availability and accessibility. These data can inform reentry planning, and can direct investment in services for this population to priority regions.

Results indicate a need for investment across the state, and particularly in rural regions, in behavioral health services for youth reentering the community after confinement in residential juvenile justice facilities. While maps of federally designated mental health professional shortage areas in Washington State already suggest that access to care is most limited in rural regions (Washington State Department of Health, 2018), the results of this study provide additional detail by visualizing the two dimensions of availability and accessibility, and by targeting analysis to the population of youth reentering the community after residential confinement in the juvenile justice system. Past studies have documented the unique behavioral health needs of rural populations, and have proposed solutions such as telehealth, behavioral health integration in primary care settings, improving care coordination across providers, and transportation improvements to increase access (Arcury, Preisser, Gesler, & Powers, 2006; Hilty et al., 2013; Smalley et al., 2010; Wong & Regan, 2009). It is possible that these and other solutions designed to serve patients in rural areas could also benefit youth reentering the community after confinement in the juvenile justice system.

Future investment in services should also consider the unique behavioral health, developmental, and legal circumstances of this youth population. For example, services should be designed to address psychosocial factors unique to adolescent development, including the impact of conviction and confinement on adolescent psychology (Mears & Travis, 2004; Steinberg,

Chung, & Little, 2004). In addition, careful consideration should be given to services for youth with co-occurring mental health and substance use conditions. According to this analysis, of the 677 youth in the study population with a history of behavioral health diagnosis, 38% had a history of both mental health and substance use diagnosis. Behavioral health services for this population should include integrated mental health and substance use treatment, and should address the possibility that a primary mental health disorder has led to a secondary substance use condition (Drake, Mueser, Brunette, & McHugo, 2004; Kessler et al., 1996).

While past research has examined youth access to behavioral health services after reentry at the municipal level (Abrams & Freisthler, 2010), this study represents an original application of spatial analysis to understanding youth geographic access to behavioral health services after reentry across an entire state. This analysis also shows that readily available youth and facility location data can be combined to identify potential gaps in geographic access to services, even when using exact youth home address is infeasible or undesirable to protect youth privacy. Geolocating youth to both unweighted areal unit centers, and population-weighted areal unit centers can provide a reasonable range of estimates of geographic access to services when exact youth location is unknown.

6. Limitations

While this study provides important evidence to guide juvenile justice and behavioral health policy and practice, limitations remain. First, to ensure methods can be replicated in a resource-constrained agency setting, the geographic measures used in this analysis do not take into account travel time or different modes of transportation. Future research could incorporate more

complex methods for measuring geographic access to services such as travel time-based measures (Apparicio, Abdelmajd, & Shearmur, 2008; Bosanac, Parkinson, & Hall, 1976; Cromley & McLafferty, 2012); the two-step floating catchment area method that takes into account provider capacity (Luo & Qi, 2009; Ngui & Vanasse, 2012; Wang & Luo, 2005); or gravity models that take into account the “attractiveness” of health services such as price and cultural appropriateness (Cromley & McLafferty, 2012; Schuurman, Bérubé, & Crooks, 2010).

Second, in an aim to rely on preexisting data that could be readily accessed by Juvenile Rehabilitation staff, this analysis classified youth as potentially in need of behavioral health services based on administrative intake and follow-up forms collected during the youth’s confinement in Juvenile Rehabilitation. It is possible that the data recorded on these administrative forms was inaccurately reported, or that the youth may no longer be in need of services following reentry to the community. In addition, these administrative forms provide limited information on specific behavioral health diagnosis. Future studies could consider specific diagnoses, and could validate diagnoses and treatment recommendations during and after reentry against medical records or another trusted source.

Third, to maintain a practical scope for analysis, this study did not directly take into account important barriers to service utilization and access besides geography. Additional information on social, economic, legal, and environmental factors that influence youth access and utilization of behavioral health services could inform future studies of geographic access to care following reentry to the community. For example, additional research might incorporate survey data or qualitative interviews to contextualize the role of geography relative to other factors that influence youth access to services. Particular attention should be given to causes and consequences of racial disparities in access to behavioral health services for this youth population, as youth of color are

disproportionately overrepresented in the juvenile justice system, and associations have been observed between race and access to behavioral health care for high risk youth (Garland et al., 2005).

Fourth, while past studies of youth access to services have relied on directory data (Abrams & Freisthler, 2010), the directory-based facilities dataset used in this analysis was limited in scope. The dataset does not include data on potentially relevant facility attributes such as number of providers, specific type of treatment offered, whether the facility accepts patients with criminal or felony backgrounds, and whether the facility specializes in treating youth. In addition, the facilities dataset only includes behavioral health facilities that registered with the state, and does not include unregistered providers, schools, or other programs that may provide behavioral health support to youth. Future studies could improve the extent to which this facilities dataset reflects the reality of the behavioral health services environment in Washington State by collecting more data on behavioral health and social services, with a focus on their accessibility to youth reentering the community from the juvenile justice system. Opportunities may exist to leverage provider datasets developed for past studies, such as the dataset created for Walker et al.'s (2016) analysis of children's access to evidence-based behavioral health services in Washington State. One important area of future research includes determining the extent to which youth age and criminal history affect eligibility for behavioral health and other services.

7. Conclusions

This exploratory study identified areas of misalignment between the geographic distributions of behavioral health facilities, and youth reentering the community after confinement

in juvenile justice facilities in Washington State. Analysis was conducted using a pioneering approach that relied on pre-existing administrative data and open source statistical computing software to calculate geographic access to services at the state level for the youth reentering the community after release. The maps and statistics generated in this analysis present geographic access data in an understandable way that has strong potential for translation into policy and practice. Opportunity exists to build on these findings in future studies, possibly using participatory methods to engage directly with youth, to inform service planning.

Given the findings of this study and related research, policymakers, practitioners, and other stakeholders in the juvenile justice system should consider the following recommendations to address gaps in behavioral health service availability and accessibility for youth reentering the community: 1) Geographically target investment in behavioral health services for this population to regions with low service availability and accessibility, which in Washington State are primarily rural. 2) When developing behavioral health services for this population, incorporate emerging best practices in improving rural health care access such as telehealth, behavioral health integration, care coordination across providers, and transportation support for patients. 3) Ensure behavioral health services for this population take into account the unique psychosocial and developmental factors associated with adolescent neurological development, including the psychological impact of conviction and residential confinement on youth. 4) Continue to develop and implement spatial analyses to inform decision-making in the juvenile justice system, such as real-time data visualization and more complex measures of geographic access to services after youth reentry to the community.

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