

# Gaps Analysis of Research/Evidence-Based Treatment for Children's Public Mental Health in Washington State

Sarah Cusworth Walker, Ph.D., Philip Hurvitz, Ph.D., Jessica Leith, MS, & Nicholas Weiss, Ph.D.  
University of Washington School of Medicine, Department of Psychiatry and Behavioral Sciences  
*In collaboration with Felix Rodriguez, Ph.D., Gregory Endler, MA, and Katie Randall Weaver, MA, ABD,  
Division of Behavioral Health and Recovery, Department of Social and Health Services, Washington State*

In 2012, House Bill 2536 required the child serving agencies of the Department of Social and Health Services to document baseline data regarding the use and availability of evidence-based and research-based practices (R/EBPs) in Washington State<sup>1</sup>. In response, the Division of Behavioral Health and Recovery (DBHR), which oversees publicly-funded children's mental health services, conducted a survey of children's mental health agencies to obtain a statewide count of these programs to establish a baseline for subsequent reporting years. This report extends the 2012 survey findings and reports on the treatment needs of youth in the public mental health system, the distribution and capacity of R/EBPs around the state to meet these needs, and the gap between need and capacity using a Geographic Information Systems (GIS) approach.

## SPECIFIC AIMS

1. What is the current landscape of mental health treatment need for children and youth in the public system? How does this vary by geographic, racial/ethnic and gender diversity?
2. How are research and evidence-based programs for children and youth mental health dispersed throughout the state?
3. What are the areas of the state in which a youth who is receiving publicly-funded mental health services cannot access a R/EBP service within 30 minutes (treatment deserts)?<sup>2</sup>

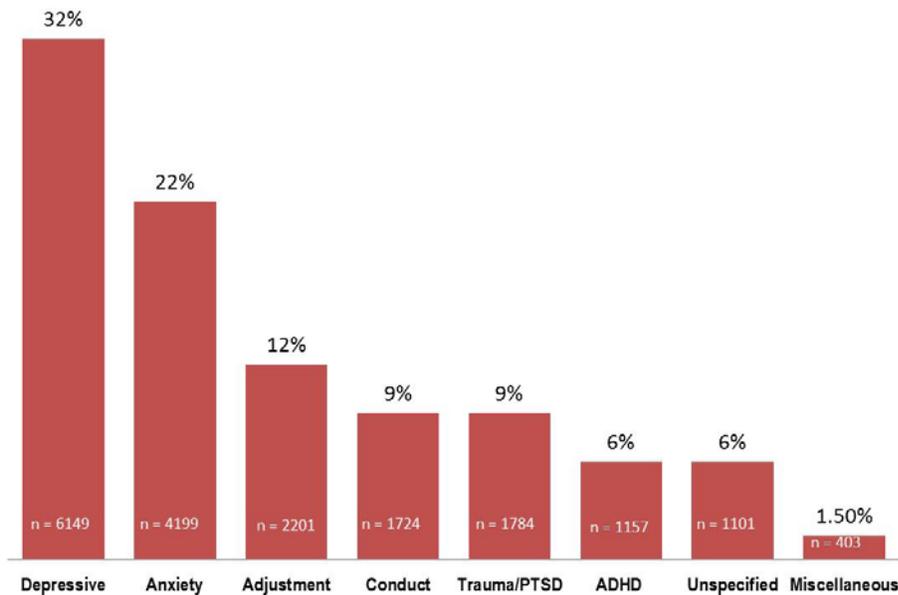
<sup>1</sup> <http://lawfilesexet.leg.wa.gov/biennium/2011-12/Pdf/Bills/House%20Passed%20Legislature/2536-S2.PL.pdf>

<sup>2</sup> The full report can be accessed through the [Evidence Based Practice Institute](#) and the [Division of Behavioral Health and Recovery](#) websites.

## PREVALENCE OF DIAGNOSES

Youth with multiple encounters with the public mental health system were assigned their most frequent diagnosis as a primary treatment need. Using this method, the most treatment needs for youth in the state are depressive disorders followed by anxiety disorders. Together, these comprise 54% of all youth diagnoses in Washington State in FY2013 and do not vary significantly by race or gender.

### Treatment Need in Numbers of Youth, FY2013



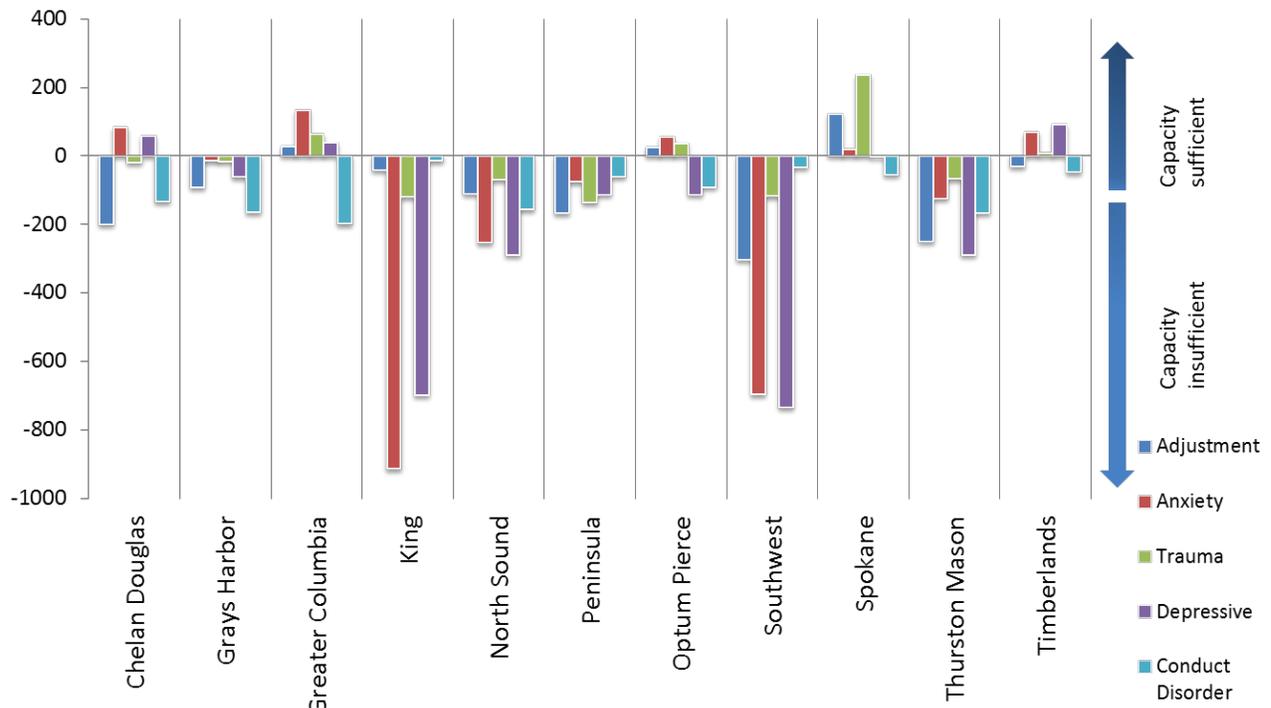
## TREATMENT DESERTS

Treatment deserts were identified by counting the number of therapists trained in a research/evidence-based practice across the state (as self-reported by regional support networks and contracted agencies) and estimating the number of youth that could be treated within each diagnostic category annually. Geographic Information Systems (GIS) was then used to identify specific areas across the state where the local need could not be met with the existing number of therapists trained in a research/evidence-based practice.

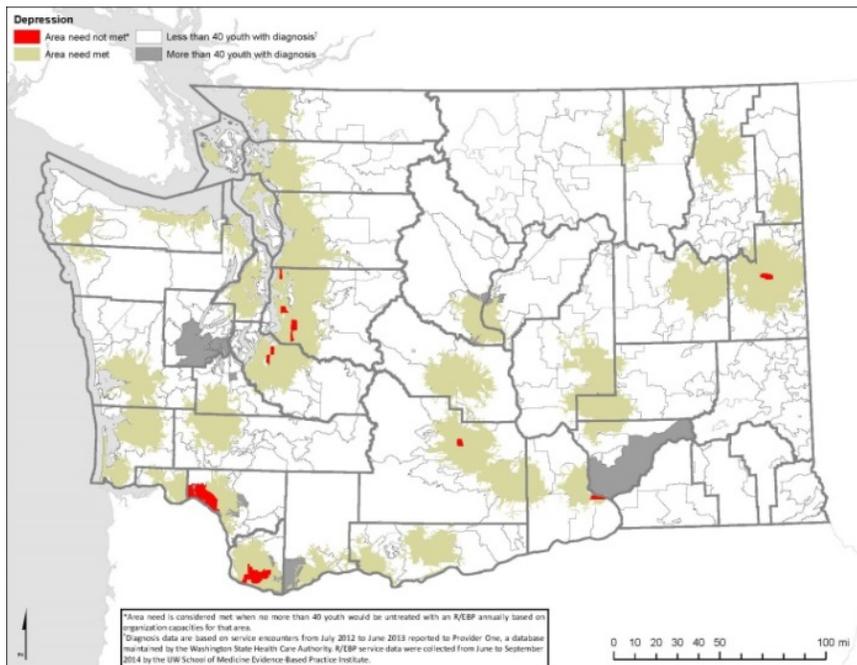
### Treatment Deserts by Diagnostic Area

Depression	Anxiety	Adjustment	Conduct Disorder
Southwest Clark county	Southwest Clark county	Southeast Chelan county	Central Grays Harbor county
Franklin county	South King county	Southwest Mason county	Southern Chelan/Douglas counties
Northern Pierce county	Franklin county	East Clallam county	Franklin county
Western King county	Southeast King county	Franklin county	
East-Central Benton county	Eastern Pierce county	Western Asotin county	
Central Yakima County			
Spokane			

## Capacity to Treat Local Need in Numbers of Youth Annually by RSN FY2013



## RECOMMENDATIONS



1. Target funding investments to support training in identified hot spots for specific mental health needs.
2. The estimation of diagnostic need will be improved by collecting functional information on youth (e.g. Child and Adolescent Needs and Strengths, CANS)
3. Quality assurance and fidelity monitoring infrastructure is needed to verify the implementation of R/EBP practices.

University of Washington School of Medicine

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## Gaps Analysis of Research/Evidence-Based Treatment for Children's Public Mental Health in Washington State

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# Gaps Analysis of Research/Evidence-Based Treatment for Children’s Public Mental Health Outpatient Services in Washington State

## EXECUTIVE SUMMARY

Sarah Cusworth Walker, Ph.D., Philip Hurvitz, Ph.D., Jessica Leith, MS, & Nicholas Weiss, M.D.  
University of Washington School of Medicine, Department of Psychiatry and Behavioral Sciences

*In collaboration with Felix Rodriguez, Ph.D., Gregory Endler, MA, and Katie Weaver Randall, MA, ABD,  
Division of Behavioral Health and Recovery, Department of Social and Health Services, Washington State*

Research and evidence-based practices are an increasingly visible part of the mental health services landscape. Cost-benefit estimates demonstrate the value of these programs in reducing costly inpatient and incarceration resources while improving the well-being of clients<sup>1</sup>. In 2012, House Bill 2536 required the child serving agencies of the Department of Social and Health Services (DSHS) to document baseline data regarding the use and availability of evidence-based and research-based practices (R/EBPs) in Washington State<sup>2</sup>. The agencies were ordered to increase the use of these programs in the 2015-2017 and 2017-2019 biennia. In response, the Division of Behavioral Health and Recovery (DBHR), which oversees publicly funded children’s mental health services, conducted a survey of children’s mental health agencies to obtain a statewide count of these programs to establish a baseline for subsequent reporting years. This report yielded important information about the distribution of R/EBPs being implemented with fidelity. However, the report did not provide an estimate of treatment need or agency capacity for these programs. Both need and capacity are essential aspects for guiding treatment implementation efforts to meet the requirements of HB 2536. This report extends the 2012 survey findings and reports on the treatment needs of youth in the public mental health system, the distribution and capacity of R/EBPs around the state to meet these needs, and the gap between need and capacity using a Geographic Information Systems (GIS) approach.

<sup>1</sup> *Updated Inventory of Evidence-Based, Research-Based, and Promising Practices for Prevention and Intervention Services for Children and Juveniles in the Child Welfare, Juvenile Justice, and Mental Health Systems* (July 2014). Evidence-Based Practice Institute & Washington State Institute for Public Policy. Document No. E2SHB2536-4. Retrieved from [http://www.wsipp.wa.gov/ReportFile/1565/Wsipp\\_Updated-Inventory-of-Evidence-Based-Research-Based-and-Promising-Practices-for-Prevention-and-Intervention-Services-for-Children-and-Juveniles-in-Child-Welfare-Juvenile-Justice-and-Mental-Health-Systems\\_Report.pdf](http://www.wsipp.wa.gov/ReportFile/1565/Wsipp_Updated-Inventory-of-Evidence-Based-Research-Based-and-Promising-Practices-for-Prevention-and-Intervention-Services-for-Children-and-Juveniles-in-Child-Welfare-Juvenile-Justice-and-Mental-Health-Systems_Report.pdf) on 11/12/2014.

<sup>2</sup> <http://lawfilesexext.leg.wa.gov/biennium/2011-12/Pdf/Bills/House%20Passed%20Legislature/2536-S2.PL.pdf>

The specific aims of the Gaps Analysis were to address the following questions:

1. What is the current landscape of mental health treatment need for children and youth in the public system? How does this vary by geographic, racial/ethnic and gender diversity?
2. How are research and evidence-based programs for children and youth mental health dispersed throughout the state?
3. What are the areas of the state in which a youth who is receiving publicly-funded mental health services cannot access a R/EBP within 30 minutes (treatment deserts)?

### **Prevalence of Diagnoses**

The most common diagnoses among youth (birth thru 20) in the public system are, in order of prevalence:

- Depressive disorders (32%)
- Anxiety disorders (22%)
- Adjustment disorders (12%)
- Conduct disorders (9%)
- Trauma/Post Traumatic Stress Disorder (9%)
- Attention Deficit Hyperactivity Disorder (6%)
- Unspecified disorders (6%)
- Bipolar disorders, Psychotic disorders, Pervasive Developmental disorders, Personality disorders < 2%.

In 9 of the 11 Regional Support Networks, the most common diagnosis was for a depressive disorder. Grays Harbor was the only RSN with a diagnostic type more prevalent than depressive, anxiety or adjustment disorders with 33% of youth diagnosed with conduct disorders. Trauma was most prevalent in Peninsula (18%) followed by King (13%).

Different patterns of diagnostic prevalence are observed among age groups (0-5 years, 6-21 years, 13-17 years, 18-20 years). Adjustment disorder and conduct disorder diagnoses were more prevalent in younger ages and decreased as youth aged. Trauma, bipolar disorders and depressive disorders increased in prevalence as youth aged. 6-12 year olds had the highest proportion of anxiety disorders (29%) compared to other age groups.

No substantial differences in the distribution of diagnoses across racial/ethnic groups were observed. The “big three” categories of depressive, anxiety and adjustment disorders were the most commonly diagnosed illnesses for all groups. Smaller variations among less common diagnoses were observed. African American youth had the highest incidence of diagnosed trauma (14% vs. 9% sample average). Conduct disorders were more common with Hispanic (10%) and White non-Hispanic youth (9%) than Asian (5%) and Pacific Islander youth (5%).

The “big three” were also the most commonly diagnosed illnesses for both male and female youth. Females were also more likely to be diagnosed with trauma (12% vs. 7%) and males were more likely to be diagnosed with conduct disorders (12% vs. 6%).

### **Distribution of R/EBPs**

As self-reported by the RSNs, Southwest had the most diverse portfolio of R/EBP types - addressing 10 of the 13 reported diagnostic categories. King<sup>3</sup> RSN followed with 8 R/EBP types covered. The rest of the RSNs covered 5-7 of the program types with the exception of Thurston/Mason with 1 program type (conduct disorders only)<sup>4</sup>.

### **Unmet Treatment Need**

The biggest area of treatment need for research/evidence practices statewide is for depressive disorders (for an estimated 2,125 youth annually), followed by anxiety disorders (1,729 youth) and psychosocial treatment for ADHD (1,153 youth). However, this varies by region as indicated by the treatment deserts maps.

### **Treatment Deserts**

Treatment desert maps were created for each diagnostic category to highlight areas of unmet need, which are indicated by both dark grayscale areas (no treatment available and high need) as well as colored areas (treatment available but does not meet need). For example, the need for depression services is most concentrated in pockets of high population density along the I-5 corridor, Clark county, areas surrounding Prosser and Pasco, as well as Spokane. In most areas with significant treatment deficits, mental health agencies are available and could increase capacity to meet this need through training. However, a significant portion of the state was identified as not within a reasonable driving distance to any mental health agency (with or without R/EBPs). For these areas, increasing capacity in existing agencies will not meet need. Additional strategies to reach these families through telemedicine, home-based services, and expanding services geographically are potentially promising options.

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<sup>3</sup> Data submitted post collection deadline suggests that King RSN also covers R/EBP treatment for ADHD in addition to the reported 8 other types of treatment. This is not reflected in the report tables and maps because of incomplete information about the number of therapists trained and locations. Other estimates for anxiety, depression and trauma treatment are unchanged.

<sup>4</sup> Information submitted by Thurston/Mason after the initial data collection period indicate an increase the number of therapists trained in CBT+ which covers depressive and anxiety disorders as well.

## GAPS ANALYSIS METHODS

### Sample

**CLIENT SAMPLE.** The clinical sample for the analysis comes from service encounters reported in the Health Care Authority's State and Medicaid billing database (Provider One) which includes both Medicaid and non-Medicaid services and youth. The data received from DBHR included all intakes reported from July 2012 through June 2013, n = 23,641 with n = 18,955 unduplicated youth. Of these youth, 3,226 had more than one intake that occurred within the same time period (perfectly duplicated entries were removed, e.g., same agency, date and diagnosis). 475 youth had a second intake that occurred at least four months from the initial intake. For simplicity, the unduplicated youth, n = 18,955 make up the sample in the current

**Table 1: Sample Youth Characteristics Compared to 2010 Census**

	Gaps Sample		2010 Census
	n = 18,955	%	%
<b>Gender</b>			
Male	9975	53	49.8
Female	8980	47	50.2
<b>Race/Ethnicity</b>			
African Am	1586	8	4.8
Asian	286	2	9
Native	497	3	3
Pac Islander	168	1	1
White - NH	10036	53	72.5
White - Hispanic	1886	10	11.2
Other	2882	15	6
Multi	1549	8	
Unknown	65	0.3	
<b>Age</b>			
0-5	2144	11	
6-12	8252	44	
13-17	6914	37	
18-20	1645	9	
<b>Region</b>			
Chelan/Douglas	731	4	2
Grays Harbor	509	3	0.1
Greater Columbia	2190	12	12
King	4289	23	26
North Sound	2068	11	17
Peninsula	1060	6	4
Pierce	1948	10	12
Southwest	2994	16	8
Spokane	1657	9	11
Thurston/Mason	1113	6	4
Timberlands	396	2	1

*Note: 2011 US Census percents were not available for the age categories presented. Sample represents unduplicated youth from FY2013 data available in Provider One.*

analysis. This assumes that each youth receiving an adequate course of treatment as prescribed by an R/EBP would only need one such course of treatment throughout the year and would stay on a therapist's caseload for approximately three months. In reality, mental health services usage is characterized by a variety of use patterns (Burley, 2009). For our purposes of estimation, however, it was more straightforward to assume that an *ideal* caseload would involve one course of treatment per year. The method of assigning diagnoses to duplicate intakes and intakes with no clinical encounters is described in more detail below.

The analysis sample includes slightly more males (53%) than females (47%). White/NonHispanic youth are the most represented group (53%), followed by "other" race/ethnicity (15%), Hispanic

(10%), African American (8%), Multi-Ethnic (8%), Native American (3%), Asian (2%), Pacific Islander (1%) and unknown (.3%). Compared to the distribution of race/ethnicity in the state, African Americans and “other” races are slightly overrepresented in the Provider One encounter data. The largest age group in the sample contains youth 6-12 years of age (44%), followed by 13-17 year olds (37%). Birth to five years (11%) and youth 18-20 (9%) are less prevalent. The largest group of youth is receiving services in the King RSN area (23%), followed by Southwest (16%) and Greater Columbia (12%). Counties with a higher proportion of youth receiving intakes than what would be expected from the 2010 Census (>2% difference) include Grays Harbor and Southwest. Counties with a lower proportion (< 2% difference) than expected from the 2010 Census include King and North Sound. These differences may be due to a variety of factors including funding source and referral and population-level need. From the R/EBP service reports collected through this study, both King and North Sound have a larger portfolio of funding sources for maintaining evidence-based practices. Consequently, it is possible that proportionally more youth being treated in these areas are not reported in the Provider One system.

**AGENCY SAMPLE.** All Community Mental Health Agencies (CMHA) with RSN contracts for children’s mental health were asked to complete a services matrix (described more below) by the children’s mental health coordinator at the appropriate RSN. We received completed surveys from 111 agencies. The distribution of these agencies within RSN is illustrated in Table 2. The total number of agencies with RSN contracts was obtained through DBHR and used to calculate the rate of response. Greater Columbia and Pierce County had the lowest rates of response (63% and 67%). King followed with a response rate of 77 % and North Sound at 92%. The rest of the RNS’s (n = 7) had a 100% response rate. Agencies providing no response are included in the service maps as having no R/EBPs. While it is likely that agencies not responding to the survey had a low use of research/evidence-based practices, the results of the analysis may underrepresent the R/EBP’s available in the community due to no or delayed response for some RSNs. For the majority of RSNs (8/12), the analysis will be an accurate representation of available R/EBP programs as reported by the agencies.

**Table 2: Agency Response Rate by Regional Support Network**

RSN	n	%	rate	%
Chelan/Douglas	3	2.7	3/3	100
Grays Harbor	4	3.6	4/4	100
Greater Columbia	10	9.0	10/16	63
King	30	27.0	30/39	77
North Sound	12	10.8	12/13	92
Peninsula	4	3.6	4/4	100
Pierce	6	5.4	6/9	67
Southwest	12	10.8	12/12	100
Spokane	23	20.7	23/23	100
Thurston/Mason	3	2.7	3/3	100
Timberlands	4	3.6	4/4	100
Total	111	100.0		

## PROCEDURES

**IDENTIFYING R/EBP PROGRAMS.** Information about R/EBP services was solicited from Community Mental Health Agencies through Regional Support Networks in June 2014 following the formation of a Gaps Advisory committee. The committee members approved the format of the services matrix developed to collect information about the R/EBPs available in each agency (Appendix 1). The matrix included information on the specific service location (including satellite locations for large agencies), the name of the program, funding sources for the program, and the number of clinicians trained to implement the program currently working at the agency. In King RSN, additional information on multilingual capacity for R/EBPs was also collected. The matrix was designed to complement and extend the data collected on R/EBP services by DBHR in 2012 while also minimizing length. Because no standard metric for fidelity and competence exists for R/EBP programs in Washington State, we did not ask agencies to report on these domains. The intent was to gather information on where these practices exist in any form. The matrix was open-ended and agencies wrote in the names of programs and practices. They were directed to name programs listed on the Washington State Inventory in addition to any other programs known or suspected to have evidence for treating children's mental health needs. All R/EBPs reported by the agencies were included in the analysis regardless of funding source. Because most programs were supported through multiple funding sources (e.g., private, county and state) we do not disaggregate programs by funding. Consequently, ***R/EBPs reported in this report are not exclusively funded through RSN contracts but are accessible to youth in the public mental health system.*** Programs were then coded according to the diagnoses for which they had demonstrated successful outcomes in treatment studies (more information provided in Appendix 3). Only programs with rigorous evidence for improving outcomes were included in the gaps analysis.

**YOUTH DIAGNOSIS.** We assigned a single diagnosis to each youth even when multiple diagnoses existed in the record over the study timeframe. To conduct the gaps analysis we assumed that, in general, youth with multiple diagnoses would be treated for these diagnoses in the same number of sessions as those with one diagnosis. We would vastly overestimate the number of youth needing treatment if each diagnosis was treated as a separate "unit" (as explained above). Consequently, we assigned each youth their most common diagnosis on record for all encounters in FY2013. For youth with the same number of diagnoses, we took the first diagnosis listed in the record. Specific diagnoses were rolled up into diagnostic families (more information in Appendix 2).

**AGENCY CASELOAD CAPACITY.** Agency caseload capacity was estimated for each diagnostic category by summing together the number of therapists in that agency trained in an R/EBP. Because we did not collect the names or other identifiers of therapists, we created guidelines for when to sum therapists across programs when more than one diagnostic-specific program existed within the agency (Appendix 3).

After assigning the number of therapists to each agency for each diagnostic category and class of treatment, we estimated patient caseload capacity for each diagnostic category with the following formula:

$$\text{Estimated annual R/EBP capacity for diagnostic category} = T * X_a (.50) (X_b) (.80)$$

Where T = the number of therapists trained to treat that diagnostic category. Where  $X_a$  = the estimated per therapist caseload in general practice per year. For most diagnostic categories we assume an annual caseload of 60 clients. This figure was determined after speaking to experts in each EBP area, several mental health agencies and literature searches for specific program requirements. The 0.50 reduction accounts for an average caseload that is half adult and half youth. While different agencies will have different ratios of adult to youth clientele, we assume that over all state agencies about half of caseloads are available for treating youth. Where  $X_b$  = a reduction to account for the diversity of types of diagnoses seen on a typical caseload. Based on conversations with mental health agencies, we assume the majority of therapists are expected to treat all Axis I disorders, consequently, available caseload should be

**Table 3: Multiplier Values to Adjust Capacity for Diagnostic Prevalence**

Category	Multiplier
Adjustment	0.11
Anxiety	0.214
Trauma	0.09
Bipolar	0.015
Depressive	0.316
Psychotic	0.03
Pervasive Dev	0.004
ADHD	0.058
Conduct	0.089
Personality	0.0002
Eating	0.0002

apportioned to expect a diversity of needs. Consequently, we allot a percentage of each caseload to specific diagnostic categories based on the state distribution of these diagnoses using data from the study sample database (see Table 4).

The multipliers do not sum to 1 (100%) because of the remaining unspecified diagnoses and infrequent diagnoses that therapists are also managing on their caseloads. The 0.80 reduction reflects the estimated 80% of cases that are being reported in Provider One versus other clients not receiving state/federal dollars who are also being treated by the same therapists. This figure was determined after discussing the distribution of funding sources within therapist caseloads with multiple agencies.

**Example.** Agency X has two programs rated as highly indicated (A) for depression. Five therapists are reported as trained in Program A and four therapists in Program B. Consequently,

$$T = (5+4) = 9, X_a = 60, X_b = .316.$$

$$\text{Number of youth with depression the agency can serve with an R/EBP a year} = 9 * 60 (.50) (.316) (.80) = 68.25$$

## RESULTS

### DISTRIBUTION OF YOUTH DIAGNOSES

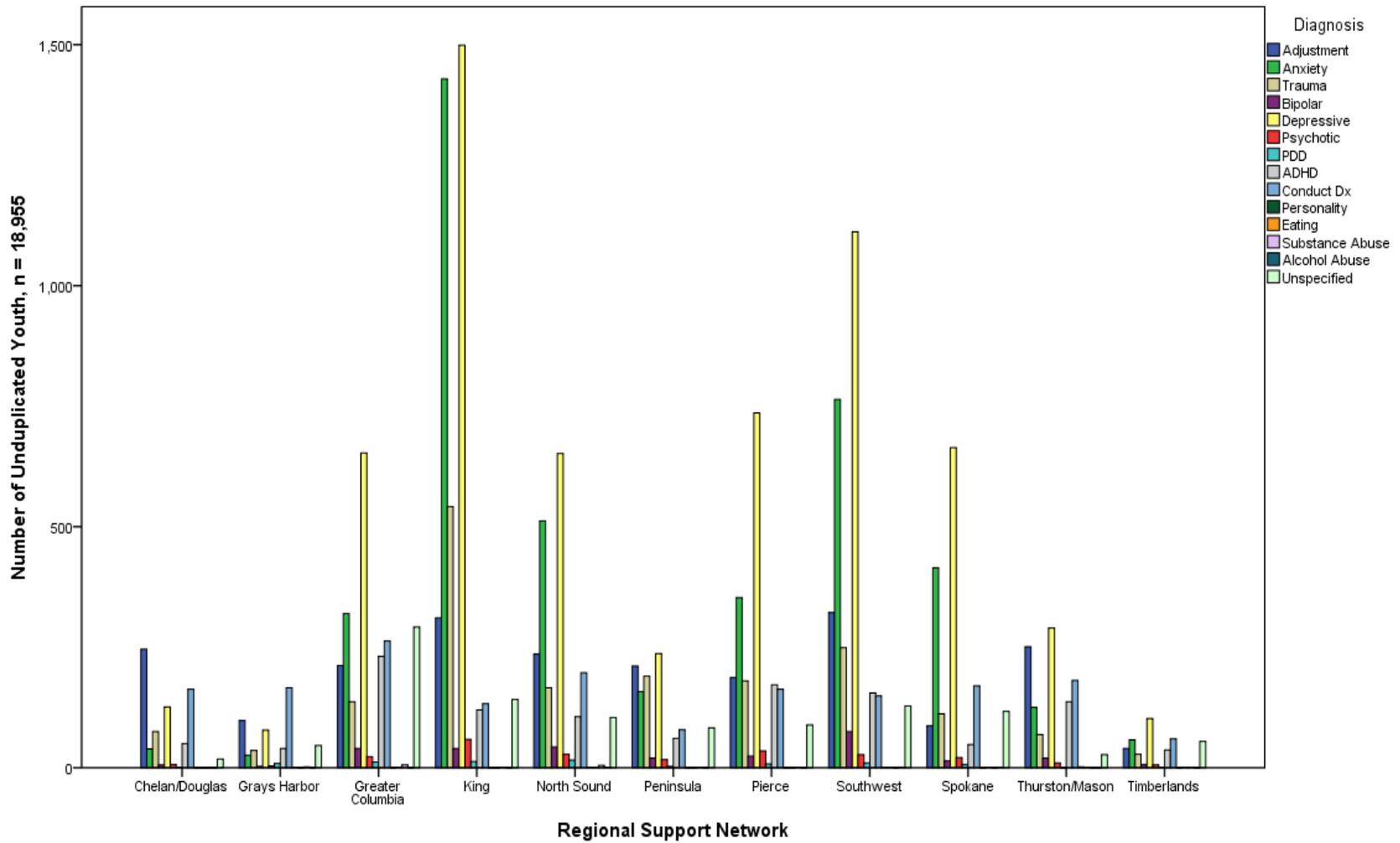
#### DISTRIBUTION OF DIAGNOSTIC CATEGORIES ACROSS REGIONAL SUPPORT NETWORK AREAS

The distribution of diagnoses varies across RSN in proportion of need per RSN and in absolute quantity per region. When youth are assigned their most common diagnosis, the highest diagnostic areas of need are for depressive disorders (32% of all diagnoses) and anxiety disorders (22%). In 9 of the 11 RSNs, depressive disorders are the most common diagnosis (Greater Columbia, King, North Sound, Peninsula, Pierce/Optum, Spokane, Southwest, Timberlands, Thurston/Mason). Chelan/Douglas's highest diagnostic type is adjustment disorder followed by conduct disorder. Grays Harbor's most common diagnostic type is conduct disorder followed by adjustment disorder. If adjustment disorder is considered a subtype of depression/anxiety, Grays Harbor is the only county with a diagnostic type (conduct disorder) more prevalent than depressive or anxiety disorders. Trauma/PTSD is proportionally most prevalent in Peninsula (18%), followed by King (13%). In other counties, Trauma/PTSD makes up 10% or less of all diagnoses. Conduct disorder varies considerably across regions from a proportionate high in Grays Harbor (33%) and Chelan/Douglas (22%), mid-range prevalence in Timberlands (16%), Thurston/Mason (15%), and Greater Columbia (12%) and 10% or below in the remaining regions (Table 5 and Figure 1).

**Table 4: Counts of Diagnostic Categories for Provider One Youth Ages 0-20 by Regional Support Network, FY2013**

Diagnostic Categories		Regional Support Networks											Total
		Chelan/ Douglas	Grays Harbor	Greater Columbia	King	North Sound	Peninsula	Optum Health	Spokane	Southwest	Timberlands	Thurson/ Mason	
Adjustment	n	246	98	212	311	236	211	187	87	322	40	251	2201
	%	33.7%	19.3%	9.7%	7.3%	11.4%	19.9%	9.6%	5.3%	10.8%	10.1%	22.6%	11.6%
Anxiety	n	39	26	320	1429	512	158	353	415	764	58	125	4199
	%	5.3%	5.1%	14.6%	33.3%	24.8%	14.9%	18.1%	25.0%	25.5%	14.6%	11.2%	22.2%
Trauma	n	75	36	137	542	166	190	180	112	249	28	69	1784
	%	10.3%	7.1%	6.3%	12.6%	8.0%	17.9%	9.2%	6.8%	8.3%	7.1%	6.2%	9.4%
Bipolar	n	6	3	40	40	43	20	24	14	75	7	20	292
	%	.8%	.6%	1.8%	.9%	2.1%	1.9%	1.2%	.8%	2.5%	1.8%	1.8%	1.5%
Depressive	n	126	78	653	1499	652	237	736	664	1112	102	290	6149
	%	17.2%	15.3%	29.8%	34.9%	31.5%	22.4%	37.8%	40.1%	37.1%	25.8%	26.0%	32.4%
Psychotic	n	7	4	23	59	28	17	35	21	27	6	10	237
	%	1.0%	.8%	1.1%	1.4%	1.4%	1.6%	1.8%	1.3%	.9%	1.5%	.9%	1.3%
PDD	n	1	9	12	13	16	3	8	7	10	1	0	80
	%	.1%	1.8%	.5%	.3%	.8%	.3%	.4%	.4%	.3%	.3%	0.0%	.4%
ADHD	n	50	40	231	120	106	61	172	48	155	37	137	1157
	%	6.8%	7.9%	10.5%	2.8%	5.1%	5.8%	8.8%	2.9%	5.2%	9.3%	12.3%	6.1%
Conduct Dx	n	163	166	263	133	197	79	163	170	149	60	181	1724
	%	22.3%	32.6%	12.0%	3.1%	9.5%	7.5%	8.4%	10.3%	5.0%	15.2%	16.3%	9.1%
Personality	n	0	1	0	0	1	0	0	0	1	0	2	5
	%	0.0%	.2%	0.0%	0.0%	.0%	0.0%	0.0%	0.0%	.0%	0.0%	.2%	.0%
Eating	n	0	0	1	0	1	0	0	1	1	1	1	6
	%	0.0%	0.0%	.0%	0.0%	.0%	0.0%	0.0%	.1%	.0%	.3%	.1%	.0%
Substance Abuse	n	0	2	6	1	5	1	1	0	0	1	0	17
	%	0.0%	.4%	.3%	.0%	.2%	.1%	.1%	0.0%	0.0%	.3%	0.0%	.1%
Alcohol Abuse	n	0	0	0	0	1	0	0	1	1	0	0	3
	%	0.0%	0.0%	0.0%	0.0%	.0%	0.0%	0.0%	.1%	.0%	0.0%	0.0%	.0%
Unspecified	n	18	46	292	142	104	83	89	117	128	55	27	1101
	%	2.5%	9.0%	13.3%	3.3%	5.0%	7.8%	4.6%	7.1%	4.3%	13.9%	2.4%	5.8%
Total	n	731	509	2190	4289	2068	1060	1948	1657	2994	396	1113	18955
	%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Figure 1: Number of Youth (Ages 0-20) Within Diagnostic Categories by Regional Support Network, FY2013



## DISTRIBUTION OF DIAGNOSTIC CATEGORIES ACROSS AGE GROUPS

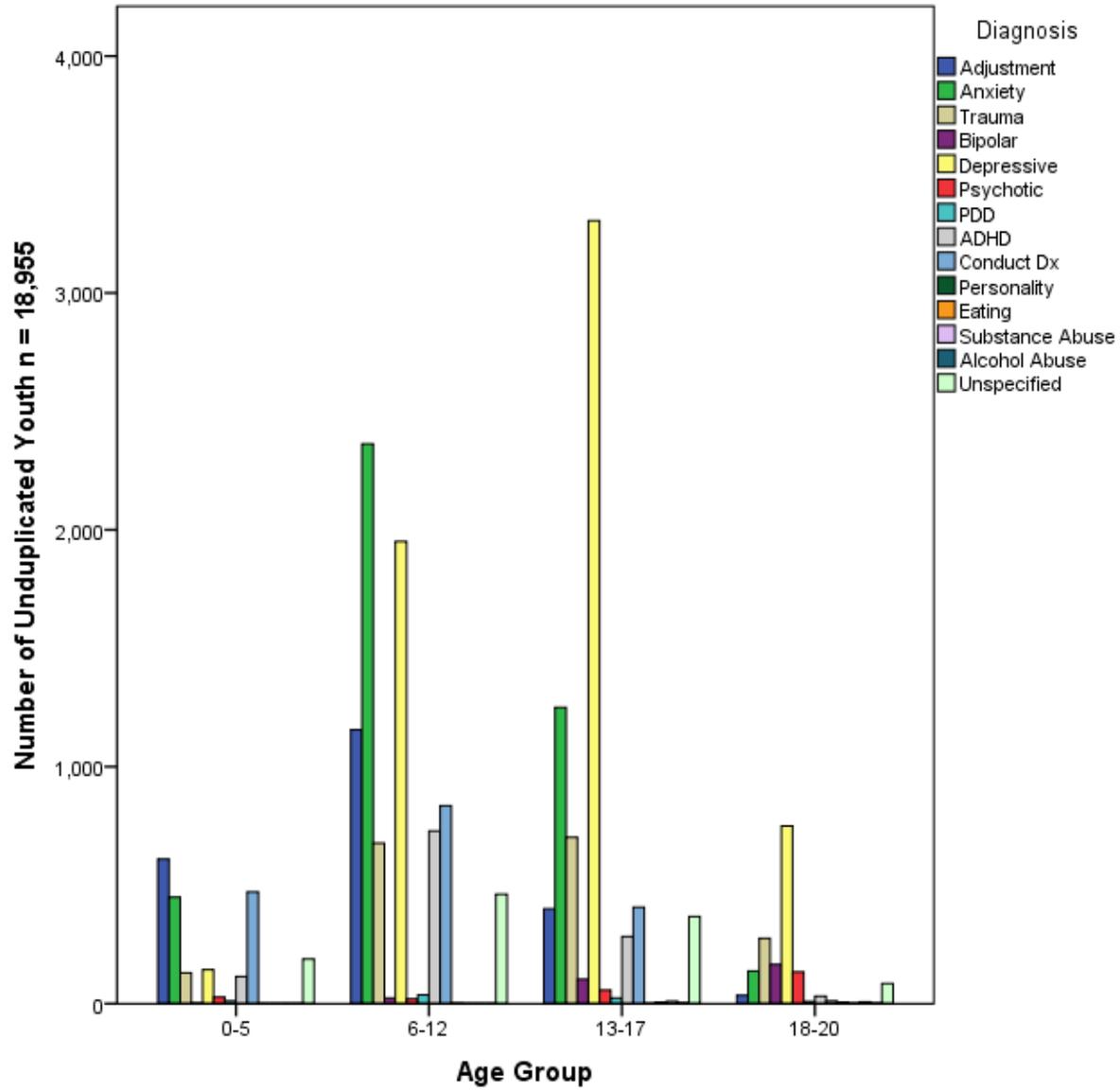
Diagnostic prevalence varies considerably among age groups (0-5 years, 6-12 years, 13-17 years, 18-20 years). The most common diagnosis for children 0-5 is adjustment disorder (29%), followed by conduct disorder (22%) and anxiety disorder (21%). The most common diagnosis for children 6-12 is anxiety disorder (29%) followed by depressive disorder (24%) and adjustment disorder (14%). Nearly half of all diagnoses for youth 13-17 are for depressive disorder (48%), followed by anxiety (18%) and trauma (10%). Young adults ages 18-20 are also most often seen for depressive disorder (46%) followed by trauma (17%). Overall, adjustment disorder and conduct disorder decrease in prevalence as youth age while trauma, bipolar

disorder and depressive disorder increase as youth age.

**Table 5: Diagnostic Categories Provider One Youth Ages 0-20 FY2013**

Diagnostic Category		Age Group					Total
		0-5	6-12	13-17	18-20		
Adjustment	n	610	1156	400	35	2201	
	%	28.5%	14.0%	5.8%	2.1%	11.6%	
Anxiety	n	449	2363	1250	137	4199	
	%	20.9%	28.6%	18.1%	8.3%	22.2%	
Trauma	n	130	677	702	275	1784	
	%	6.1%	8.2%	10.2%	16.7%	9.4%	
Bipolar	n	1	23	103	165	292	
	%	.0%	.3%	1.5%	10.0%	1.5%	
Depressive	n	143	1951	3305	750	6149	
	%	6.7%	23.6%	47.8%	45.6%	32.4%	
Psychotic	n	27	19	57	134	237	
	%	1.3%	.2%	.8%	8.1%	1.3%	
PDD	n	11	37	23	9	80	
	%	.5%	.4%	.3%	.5%	.4%	
ADHD	n	114	729	283	31	1157	
	%	5.3%	8.8%	4.1%	1.9%	6.1%	
Conduct Dx	n	471	835	407	11	1724	
	%	22.0%	10.1%	5.9%	.7%	9.1%	
Personality	n	0	1	0	4	5	
	%	0.0%	.0%	0.0%	.2%	.0%	
Eating	n	0	0	5	1	6	
	%	0.0%	0.0%	.1%	.1%	.0%	
Substance Abuse	n	0	0	10	7	17	
	%	0.0%	0.0%	.1%	.4%	.1%	
Alcohol Abuse	n	0	0	2	1	3	
	%	0.0%	0.0%	.0%	.1%	.0%	
Unspecified	n	188	461	367	85	1101	
	%	8.8%	5.6%	5.3%	5.2%	5.8%	
Total	n	2144	8252	6914	1645	18955	
	%	100.0%	100.0%	100.0%	100.0%	100.0%	

Figure 2: Diagnostic Categories by Age Group



## DISTRIBUTION OF DIAGNOSTIC CATEGORIES ACROSS RACE/ETHNICITY

The prevalence of diagnostic categories is fairly stable across race/ethnicity. Depressive and anxiety disorders are the most commonly diagnosed categories for all groups. Some smaller variations among categories are noted. For example, the highest prevalence for trauma is among African American youth (14%) compared to the total sample prevalence of 9% (Pacific Islanders have the lowest prevalence at 5%). Conduct disorders are

**Table 6: Diagnostic Categories for Provider One Youth Ages 0-20 by Race/Ethnicity, FY2013**

Diagnostic Category	Race/Ethnicity								Total
	Hispanic	WhiteNH	African American	Asian	Pacific Isl	AI/AN	Other	Multi	
Adjustment	248 13.1%	1164 11.6%	125 7.9%	23 8.0%	16 9.5%	58 11.7%	378 13.1%	176 11.4%	2188 11.6%
Anxiety	398 21.1%	2215 22.1%	344 21.7%	76 26.6%	46 27.4%	113 22.7%	626 21.7%	367 23.7%	4185 22.2%
Trauma	200 10.6%	850 8.5%	215 13.6%	28 9.8%	9 5.4%	54 10.9%	259 9.0%	163 10.5%	1778 9.4%
Bipolar	23 1.2%	193 1.9%	22 1.4%	5 1.7%	3 1.8%	9 1.8%	17 .6%	20 1.3%	292 1.5%
Depressive	563 29.9%	3213 32.0%	567 35.8%	110 38.5%	67 39.9%	170 34.2%	940 32.6%	509 32.9%	6139 32.5%
Psychotic	21 1.1%	122 1.2%	31 2.0%	7 2.4%	5 3.0%	6 1.2%	27 .9%	18 1.2%	237 1.3%
PDD	6 .3%	54 .5%	6 .4%	1 .3%	0 0.0%	4 .8%	5 .2%	3 .2%	79 .4%
ADHD	112 5.9%	673 6.7%	97 6.1%	5 1.7%	7 4.2%	25 5.0%	139 4.8%	98 6.3%	1156 6.1%
Conduct Dx	190 10.1%	930 9.3%	120 7.6%	15 5.2%	9 5.4%	30 6.0%	290 10.1%	130 8.4%	1714 9.1%
Personality	0 0.0%	3 .0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1 .0%	1 .1%	5 .0%
Eating	0 0.0%	4 .0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1 .0%	1 .1%	6 .0%
Substance Abuse	0 0.0%	11 .1%	2 .1%	0 0.0%	0 0.0%	1 .2%	3 .1%	0 0.0%	17 .1%
Alcohol Abuse	1 .1%	1 .0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1 .1%	3 .0%
Unspecified	124 6.6%	603 6.0%	57 3.6%	16 5.6%	6 3.6%	27 5.4%	196 6.8%	62 4.0%	1091 5.8%
<b>Total</b>	<b>1886 100.0%</b>	<b>10036 100.0%</b>	<b>1586 100.0%</b>	<b>286 100.0%</b>	<b>168 100.0%</b>	<b>497 100.0%</b>	<b>2882 100.0%</b>	<b>1549 100.0%</b>	<b>18890 100.0%</b>

least likely to be diagnosed for Asian and Pacific Islander youth (5%) and most common among Hispanic and Other (10%).

**Table 7: Diagnostic Categories for Provider One Youth Ages 0-20 by Gender, FY2013**

		Gender		Total
		Female	Male	
Adjustment	n	1040	1161	2201
	%	11.6%	11.6%	11.6%
Anxiety	n	2066	2133	4199
	%	23.0%	21.4%	22.2%
Trauma	n	1087	697	1784
	%	12.1%	7.0%	9.4%
Bipolar	n	168	124	292
	%	1.9%	1.2%	1.5%
Depressive	n	3304	2845	6149
	%	36.8%	28.5%	32.4%
Psychotic	n	73	164	237
	%	.8%	1.6%	1.3%
PDD	n	8	72	80
	%	.1%	.7%	.4%
ADHD	n	232	925	1157
	%	2.6%	9.3%	6.1%
Conduct	n	492	1232	1724
	%	5.5%	12.4%	9.1%
Personality	n	1	4	5
	%	.0%	.0%	.0%
Eating	n	5	1	6
	%	.1%	.0%	.0%
Substance Abuse	n	5	12	17
	%	.1%	.1%	.1%
Alcohol Abuse	n	1	2	3
	%	.0%	.0%	.0%
Unspecified	n	498	603	1101
	%	5.5%	6.0%	5.8%
Total	n	8980	9975	18955
	%	100.0%	100.0%	100.0%

#### DISTRIBUTION OF DIAGNOSTIC CATEGORIES ACROSS GENDER

For both male and female youth, depressive disorder is the most commonly diagnosed category followed by anxiety and adjustment disorders. Variations in diagnostic prevalence are noted in smaller categories. Females are more likely to be diagnosed with trauma (12% vs. 7%) and males are more likely to be diagnosed with conduct disorder (12% vs. 6%).

### NUMBER OF THERAPISTS BY R/EBP RATING

The number of therapists per agency was summed within RSN to provide a total count of therapists trained in R/EBPs within each diagnostic category. The therapist counts are separated by program rating level, A = well supported, B = moderately supported, C = well supported but not on inventory. Across the RSN areas, the highest number of therapists are trained in Level A trauma interventions (n = 686), followed by Level A conduct disorder interventions (n = 550), Level B adjustment disorder interventions (n = 443), Level A depressive disorder interventions (n = 483), and Level A anxiety disorder interventions (n = 422; Table 9). R/EBP interventions at any level were not reported for eating, psychotic or bipolar disorders. Because the number of trained therapists may be duplicated across diagnostic categories, it is not appropriate to sum the therapists within RSN to provide a total number of therapists trained in R/EBPs across all categories.

### THERAPIST CAPACITY BY DIAGNOSTIC CATEGORY AND REGIONAL SUPPORT NETWORK

To estimate R/EBP therapist capacity, the number of therapists trained in any level of R/EBP (A,B,C) within diagnostic category was summed for each RSN. The formula used in the procedures section was then applied to estimate the number of youth that could be served for each RSN. The total number of youth within diagnostic category for each RSN was then subtracted from this therapist capacity estimate (estimated number of youth served per agency) to derive a difference score that represents the capacity (in numbers of youth) that exceed current need (positive integers) or are insufficient to meet need (negative integers). These numbers can be interpreted as excess capacity or insufficient capacity. Values close to zero indicate a match between capacity and need. As noted in the procedures section, the therapist capacity estimates are based on program funded from multiple sources and should not be interpreted as reflecting the funding capacity of RSNs to sustain R/EBPs within existing funds and contracts. The table can be used to identify areas of particular need for each region.

- Chelan/Douglas is slightly exceeding need for depressive and anxiety disorders (60-80 cases a year) while not meeting need for adjustment disorder (-201 cases), conduct disorder (-135 cases) and ADHD (-50 cases a year).
- Grays Harbor is not meeting need for more than 50 cases a year for conduct (-166), adjustment (-93), and depressive (-62) disorders.
- Greater Columbia is exceeding need for anxiety and trauma (134 and 64 cases) while not meeting need for ADHD (-231 cases) or conduct disorder (-200).
- King<sup>5</sup> is not meeting need for anxiety (-915 cases), depressive (-700 cases), trauma (-121 cases), and ADHD (-120 cases) disorders.

<sup>5</sup> These numbers may underestimate treatment capacity as a result of revised data submitted by the King County RSN post-data collection in which it was reported that 12 and 16 therapists were available to treat Trauma and ADHD, respectively. These numbers

- North Sound is not exceeding need in any diagnostic categories and is not meeting need with more than 50 cases a year for depressive (-291 cases), anxiety (-255 cases), adjustment (-112 cases), ADHD (-106 cases), conduct (-158 cases) and trauma disorders (-71 cases).
- Peninsula is not meeting need for trauma (-138 cases), depressive (-114 cases), adjustment (-169 cases) and anxiety disorders (-77 cases).
- Pierce is meeting need in most categories but is insufficient for depressive (-114 cases), and ADHD (-172 cases) and conduct disorder (-92 cases).
- Southwest is not meeting capacity for depressive (-736 cases), anxiety (-698 cases), adjustment (-304 cases), ADHD (-151 cases) and trauma disorders (-119 cases).
- Spokane is exceeding capacity for trauma (236 cases) and adjustment disorders (122 cases).
- Thurston/Mason is not meeting capacity for adjustment (-251 cases), depressive (-290 cases), conduct (-168 cases), ADHD (-137 cases) and anxiety (-125 cases).
- Timberlands is exceeding capacity for depressive (90 cases) and anxiety (68 cases) disorders.

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are not incorporated into the tables and maps due to incomplete information about part-time/fulltime status of therapists and the due date for the report.

**Table 8: Number of Therapists Trained in R/EBP by Diagnostic Category and RSN, FY2013.**

		Regional Support Network											
		Chelan/ Douglas	Grays Harbor	Greater Columbia	King	North Sound	Peninsula	Pierce	Southwest	Spokane	Thurston/ Mason	Timberlands	Total
Adjustment	A	0	0	0	0	0	0	0	0	0	0	0	0
	B	17	2	90	102	47	16	80	7	79	0	3	443
	C	0	0	0	0	0	0	0	0	0	0	0	0
Depressive	A	24	0	90	104	47	16	81	45	51	0	25	483
	B	0	2	0	0	0	0	0	4	35	0	0	41
	C	0	0	0	0	0	0	0	0	0	0	0	0
Anxiety	A	24	0	90	101	51	16	81	9	25	0	25	422
	B	0	2	0	1	0	0	0	4	61	0	0	68
	C	0	0	0	0	0	0	0	0	0	0	0	0
Trauma	A	25	7	93	195	44	24	100	56	126	0	16	686
	B	0	2	0	0	0	0	0	4	35	0	0	41
	C	0	0	0	0	0	0	0	0	0	0	0	0
Conduct	A	13	0	26	51	18	8	33	48	53	0	5	255
	B	0	0	3	3	0	0	0	5	0	6	0	17
	C	0	0	0	0	0	0	0	0	0	0	0	0
Substance Abuse	A	0	0	3	3	0	0	0	12	0	6	0	24
	B	0	0	0	0	0	0	0	0	0	0	0	0
	C	0	0	1	0	0	0	0	12	0	0	0	13
PDD	A	0	0	0	0	0	0	0	3	0	0	0	3
	B	0	0	0	0	0	0	0	0	0	0	0	0
	C	0	0	0	0	0	0	0	0	0	0	0	0
ADHD	A	0	0	0	0	0	0	0	3	0	0	0	3
	B	0	0	0	0	0	0	0	0	0	0	0	0
	C	0	0	0	0	0	0	0	0	0	0	0	0
Personality	A	0	2	0	43	5	4	0	70	5	0	2	131
	B	0	0	0	0	0	0	0	0	0	0	0	0
	C	0	0	0	0	0	0	0	0	0	0	0	0
Alcohol Abuse	A	0	0	3	3	0	0	0	6	2	6	0	20
	B	0	0	0	0	0	0	0	0	0	0	0	0
	C	0	0	0	0	0	0	0	0	0	0	0	0
Eating	any	0	0	0	0	0	0	0	0	0	0	0	0
Psychotic	any	0	0	0	0	0	0	0	0	0	0	0	0
Bipolar	any	0	0	0	0	0	0	0	0	0	0	0	0
Diagnoses Addressed		5	5	7	8	6	6	5	10	7	3	6	10

**Table 9: Excess and Insufficient Capacity to Meet Need with an R/EBP, in Numbers of Youth**

	Regional Support Network											Total
	Chelan/ Douglas	Grays Harbor	Greater Columbia	King	North Sound	Peninsula	Pierce	Southwest	Spokane	Thurston/ Mason	Timberlands	
Depressive	58	-63	38	-700	-291	-114	-114	-736	-4	-290	90	-2125
Anxiety	82	-16	134	-915	-255	-77	55	-698	18	-125	68	-1729
Trauma	-21	-17	64	-121	-71	-138	36	-119	236	-69	7	-214
Conduct	-135	-166	-200	-16	-158	-62	-92	-35	-56	-168	-49	-1136
Adjustment	-201	-93	26	-42	-112	-169	24	-304	122	-251	-32	-1031
PDD	-1	-9	-12	-13	-16	-3	-8	-10	-7	0	-1	-80
ADHD	-50	-40	-231	-120	-106	-61	-172	-151	-48	-137	-37	-1153
Substance Abuse	0	-2	-6	-1	-5	-1	-1	1	0	0	-1	-16
Alcohol Abuse	0	0	1	1	-1	0	0	2	0	3	0	7
Personality	0	-1	0	0	-1	0	0	-1	0	-2	0	-4
Bipolar	-6	-3	-40	-40	-43	-20	-24	-75	-14	-20	-7	-292
Psychotic	-7	-4	-23	-59	-28	-17	-35	-27	-21	-10	-6	-237
Eating	0	0	-1	0	-1	0	0	-1	-1	-1	-1	-6

*Note.* Values are the difference between estimated numbers of youth that can be served at an agency (therapist capacity) and numbers of youth in need. Values of zero indicate the need is met. Positive integers indicate an excess of therapist capacity. Negative integers indicate the estimated number of youth exceeding therapist capacity.

Using ArcGIS, a geocoding program, we drew 20 miles service areas around each mental health agency contracted through the RSNs (10 miles within King County to adjust for traffic congestion) using existing roads. Using a procedure described in the technical appendices, youth were apportioned evenly across zip coded areas and overlaid on top of agency service areas to develop the capacity estimates shown on the maps. The grayscale areas indicate the raw number of youth within a zip code with the indicated treatment need. These are shown to illustrate treatment need in areas with no R/EBP services. Dark gray indicates at least 40 youth a year have the indicated treatment need in that zip code area. The green areas of the map indicate areas where treatment agencies are providing an R/EBP that matches the treatment need. To identify “treatment deserts” for immediate intervention, we color service areas that are not meeting local need in red. Not meeting need is defined as more than 40 youth a year who cannot be treated with an R/EBP for that need given the existing service capacity. The service area is considered to meet need if no more than 40 youth a year cannot be treated with an R/EBP for that need (up to 39 untreated youth a year). **Accordingly, both dark gray and red areas are “treatment desert” areas for immediate intervention for the indicated diagnostic area.**

### Depression Service Deserts

The areas of greatest unmet need for depression R/EBP services, based on the incident of depression diagnoses in those areas, are in southwest Clark County, followed by Franklin County. Other areas of need are in northern Pierce county and western King county<sup>6</sup> along the north-south axis as well as spots in east-central Benton county, central Yakima county and Spokane.

### Anxiety Service Deserts

The areas of greatest unmet need for anxiety R/EBP services are in southwest Clark County, south King County, Franklin County, and southeast King County<sup>7</sup> into far eastern Pierce County.

### Adjustment Service Deserts

The area of greatest unmet need for adjustment disorder R/EBP services is in southeastern Chelan and southwestern Douglas counties, southwest Mason county, and east Clallam county.

### Conduct Disorder Service Deserts

The areas of greatest unmet need for conduct disorder R/EBPs are in central Grays Harbor County, and southern Chelan/Douglas Counties.

### Attention Deficit Hyperactivity Disorder Service Deserts (Psychosocial Interventions)

The areas of greatest unmet need for ADHD psychosocial interventions, are in southwest Thurston/Mason County.

### Trauma Service Deserts

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<sup>6</sup> Revised data on the availability of R/EBP’s was submitted from multiple sites within King County post collection deadline. However, the revisions do not appear to impact the north and south corridors of King county.

No areas in the state had unmet need exceeding 40 a youth a year. Need under 40 youth a year is distributed throughout the densely populated areas of the state, with a large cluster in south King county<sup>8</sup>.

### **Personality Disorder Service Deserts**

No areas in the state had unmet need exceeding 5 youth a year.

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<sup>8</sup> This number may overestimate unmet need within King county due to revised data submitted from sites received post collection deadline.

Figure 3: Depression “Treatment Deserts” for Areas with existing R/EBP Services for Depression (Red) and no Services for Depression (Gray)<sup>9</sup>

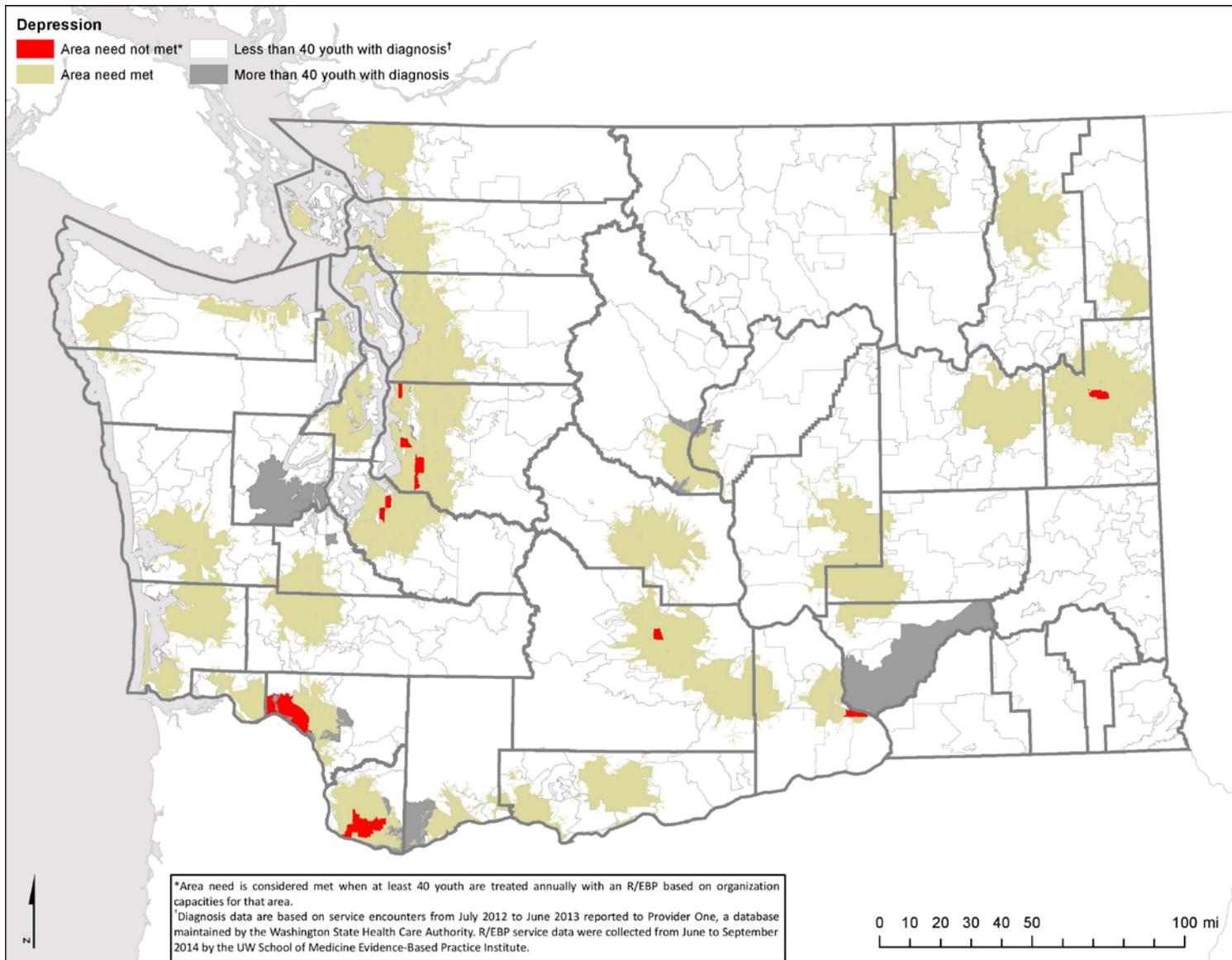


Figure 4: Anxiety “Treatment

<sup>9</sup> Thurston/Mason county reported having four therapists trained in CBT+ after the data collection period which may change the presented estimates.

Deserts” for Areas with existing R/EBP Services for Anxiety (Red) and no Services for Anxiety (Gray)

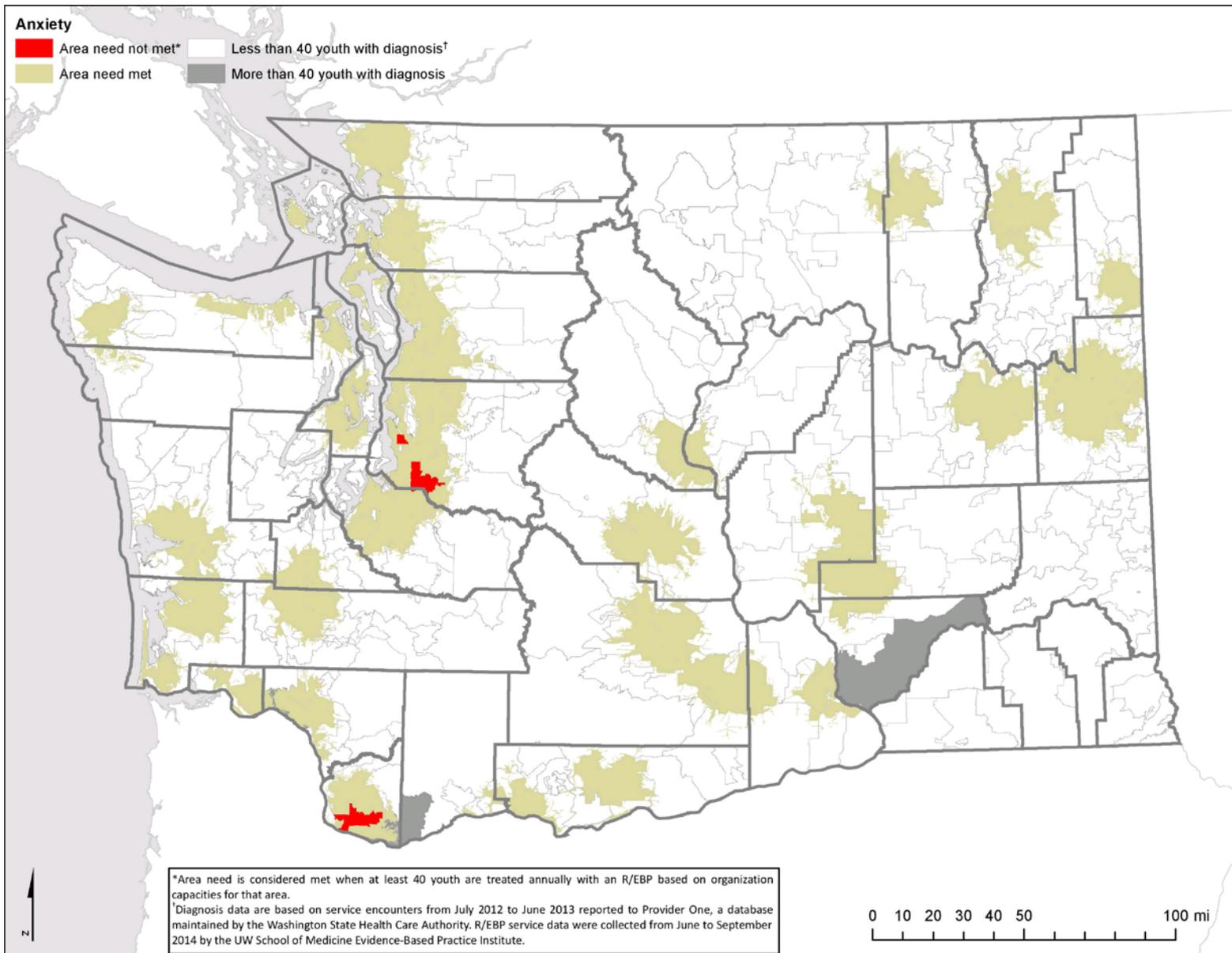


Figure 5: Trauma “Treatment Deserts” for Areas with existing R/EBP Services for Trauma (Red) and no Services for Trauma (Gray)

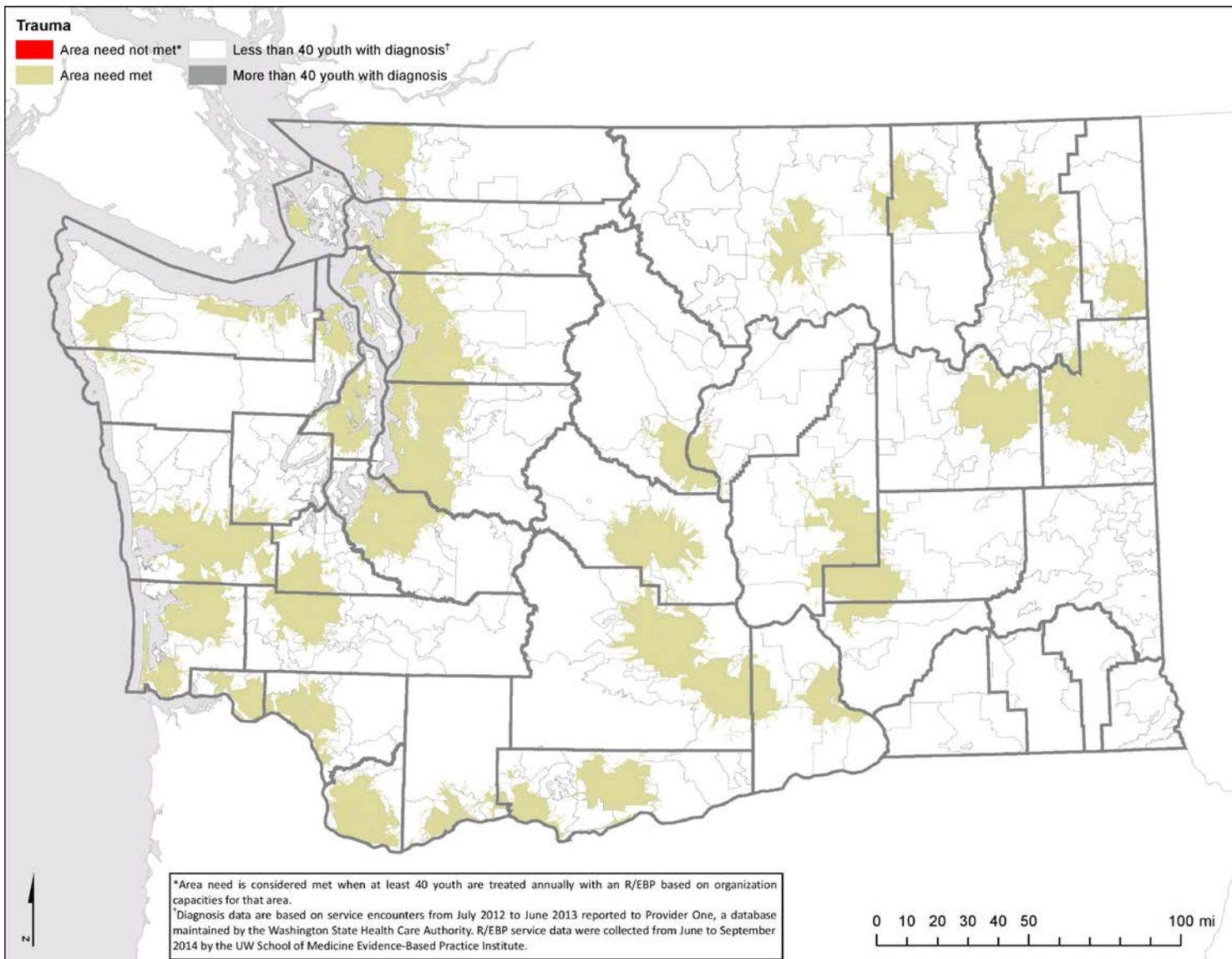


Figure 6: Conduct Disorder “Treatment Deserts” for Areas with existing R/EBP Services for Conduct Dx (Red) and no Services for Conduct Dx (Gray)

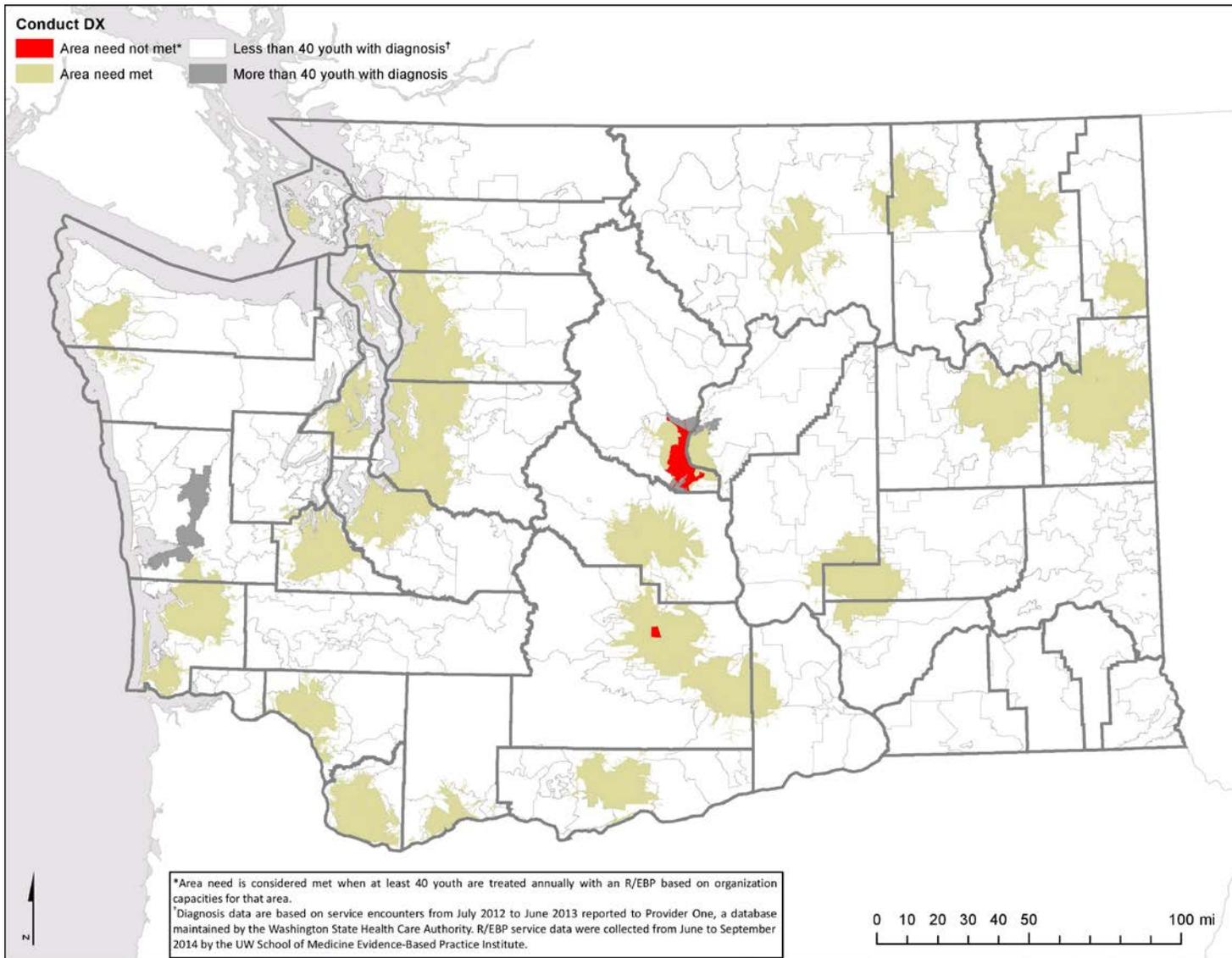


Figure 7: ADHD “Treatment Deserts” for Areas with existing R/EBP Services for ADHD (Red) and no Services for ADHD (Gray)

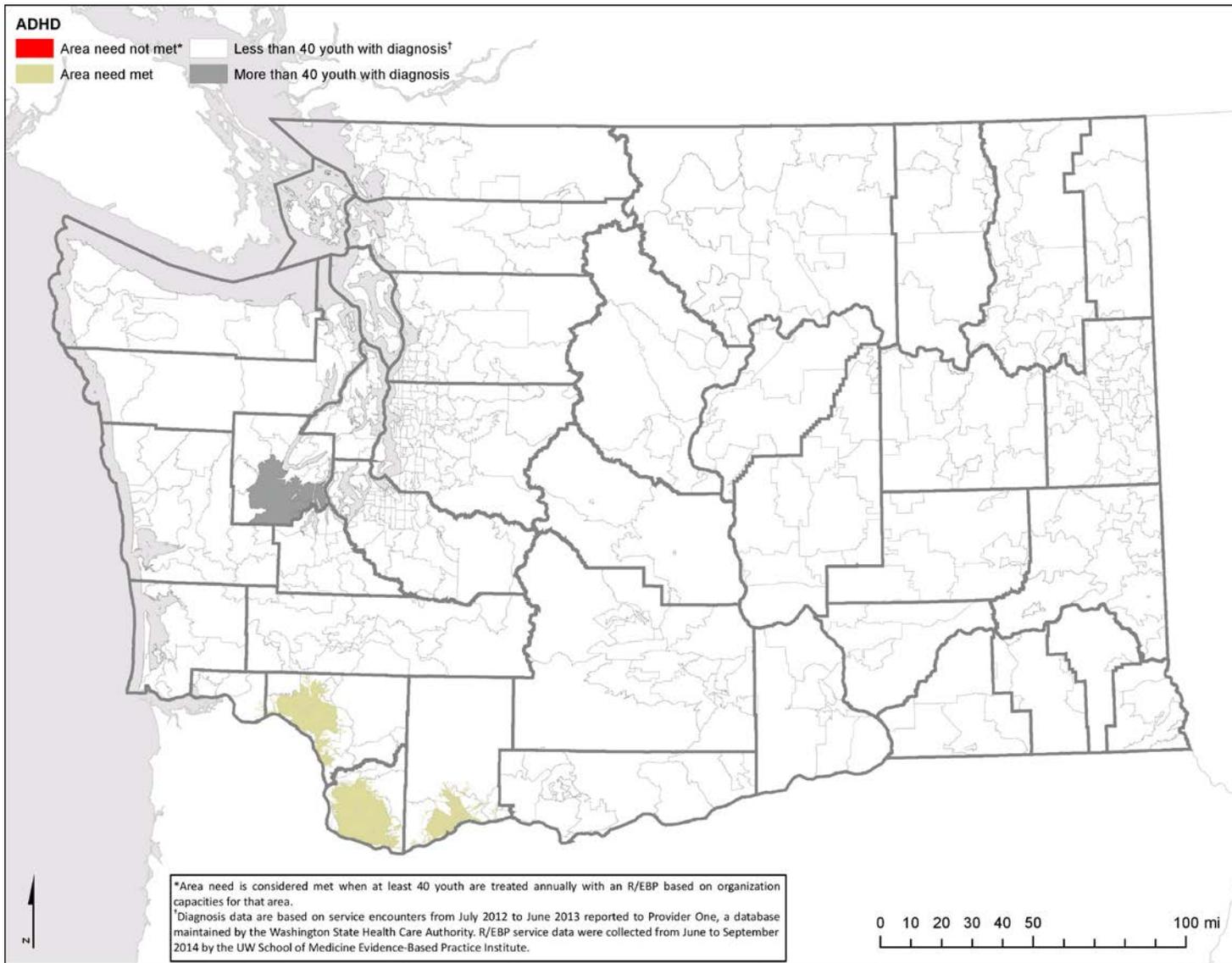
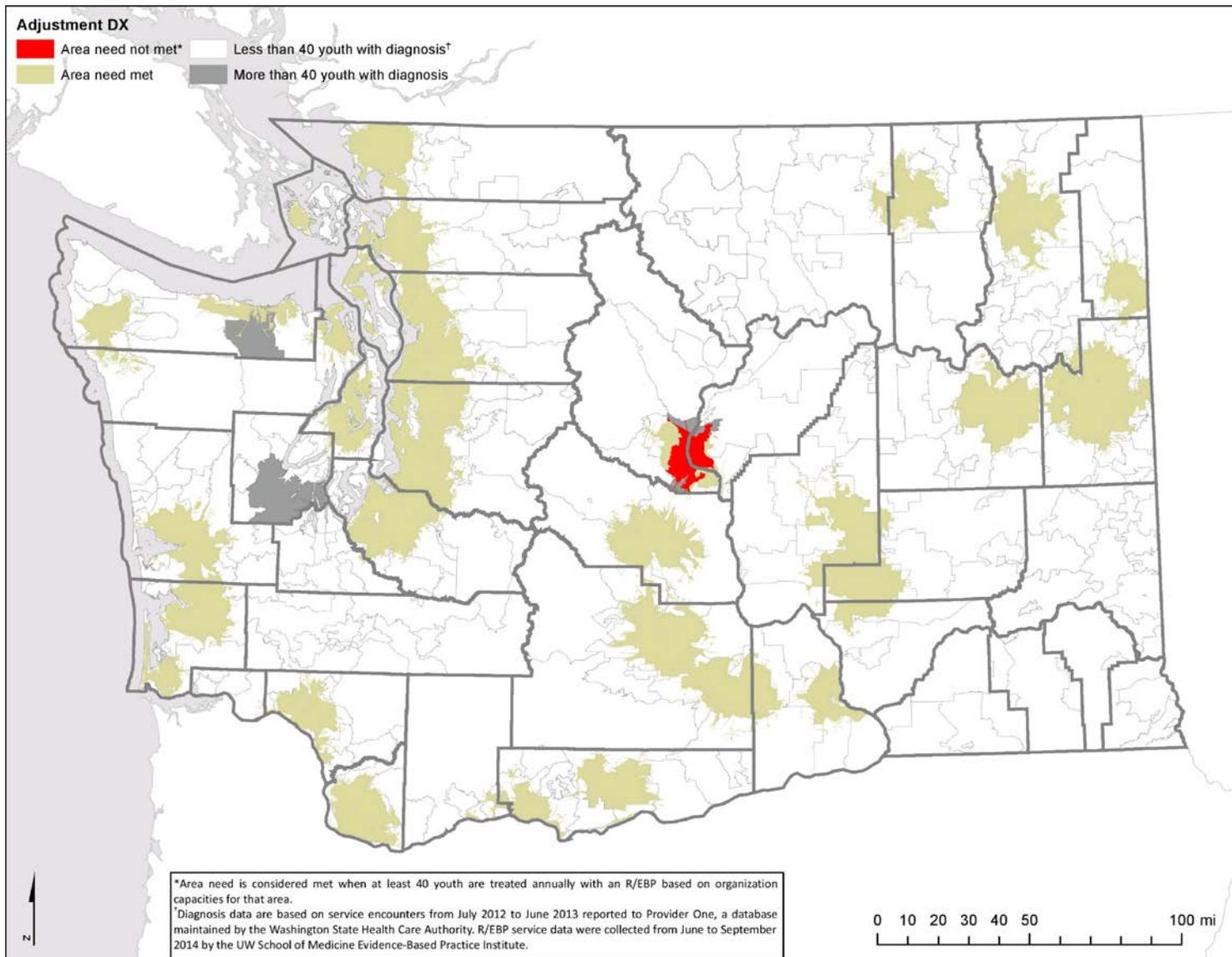


Figure 8: Adjustment Disorder “Treatment Deserts” for Areas with existing R/EBP Services for Adjustment Dx (Red) and no Services for Adjustment Dx (Gray)



The purpose of this study was to identify areas in Washington State where existing capacity to treat youth in the public mental health system with research and evidence-based practices is not currently meeting need. To do this, we used data from the state billing database for publically funded mental health services as well as program information reported by mental health agencies themselves. To estimate agency capacity we used a formula based on assumptions about caseload size, distribution of therapeutic need and demographics. All of these assumptions affect the estimates about service deserts contained in the report. For example, treatment need is based on diagnoses being reported by service providers, which is likely subject to regional differences in practice (e.g., preferences for different diagnoses for similar behavior and function). Estimates of need are also limited by the youth who are already accessing care. In areas where services are difficult to reach, the population need is likely higher than what is estimated here. Further, this report provides a picture of services available through agencies contracted by RSNs to provide publically-funded services, but not all services being provided by the agencies, and reported here, are funded by RSNs. Consequently, this report should not be interpreted as a map of services being supported through state dollars, alone, although many programs are partially funded through state support. Finally, given that DBHR is in a formative period in identifying how to implement and monitor R/EBPs, we did not ask agencies to report level of program fidelity as there are currently no shared definitions for program adherence. This is inevitably affecting some of the service desert estimates in which expectations about service provision for certain diagnoses (e.g., conduct disorder) may not be operating as expected.

The process of conducting the gaps analysis and the results suggests a number of recommendations for the continued analysis of R/EBP programming using this approach as well as for program implementation.

#### Program Recommendations

1. The gaps analysis points to the success of the RSNs, DBHR, mental health agencies and implementation partners in training a large group of providers to treat trauma and conduct disorders with R/EBPs over the past decade. While needs still exist for these interventions around the state, and barriers to service access may exist for youth and families, depression and anxiety disorders appear to now be the state's most unmet needs. Next steps might include focused conversations with areas identified on the map as having higher levels of unmet need to verify and refine capacity data and develop implementation plans using programs on the Washington State Inventory.
2. Program certification/quality assurance processes are needed to verify that programs self-reported by agencies are meeting needs as intended. For example, CBT+ is a training covering therapeutic approaches for trauma, anxiety, depression and conduct disorder. However, it is not clear whether therapists trained in this suite of techniques are using the techniques for all disorder types and with equal levels of competence. As a consequence, the most appropriate way to use this report is as a guide to where clinicians already have an orientation to R/EBPs for diagnostic areas with the need for additional follow up.

## Research Recommendations

1. Establish a routine process for updating mental health R/EBP program capacity. This could be accomplished through annual, or more frequent, audits of practice in which agency self-report of programming could be verified. To continue to provide a holistic picture of R/EBP availability, gather information on R/EBP programming occurring outside of RSN contracts but ask agencies to provide independent verification of program adherence/fidelity.
2. Access to youth-level addresses would allow for more precise estimates of geographic service needs and time to service estimates within county and zip code.
3. Additional analyses could explore the distribution of comorbid disorders, either in diagnostic pairs or clusters (e.g., anxiety and trauma) or as any cluster (e.g., two or more diagnoses). This could reveal the potential need for multifaceted interventions in specific areas of the state.
4. Merging data from substance use diagnoses and services from the behavioral health services system would also contribute to a clearer picture of how many co-occurring needs exist in the state and associated treatment availability.

## TECHNICAL APPENDICES

Appendix 1: R/EBP Community Mental Health Agency Survey

Appendix 2: DSM codes within Diagnostic Categories

Appendix 3: R/EBP Coding

Appendix 4: Geocoding Calculations

Appendix 5: Detailed maps of service capacity and need

An excerpt from the agency survey is illustrated below. Agencies were provided with repeating columns for up to ten R/EBPs per site (no agency reported 10 R/EBPs). Instructions included listing all satellite organizations so that R/EBP could be tied to specific service delivery addresses, sources of program funding, how many clinicians were trained and what names to use for programs being delivered (using Washington State billing codes/SERI).

Facility	City	County	EBP	Funding Source	Agency wide or clinician specific? If clinician only, how many?
<i>Example: Catholic Community Services</i>	<i>Vancouver</i>	<i>Clark</i>	<i>TFCBT</i>	<i>DBHR/HCA</i>	<i>Clinicians, 9</i>

<b>INSTRUCTIONS</b>					
1. Please include all facilities which are considered satellite agencies of larger organizations					
2. For EBP, please fill in whichever EBP/RBP's are offered at this particular facility to the best of your knowledge					
3. Sources of funding can include stand alone or combinations such as DBHR/HCA or County/DBHR. We are interested in knowing how the EBP's being offered are funded at any particular facility					
4. Please identify if the EBP/RBP offered is an agency wide program requiring all clinician's to be trained upon hiring and offered at this facility, or if the EBP/RBP simply have clinicians who are trained either before being hired or on their own.					
5. Please refer to the SERI codes when determining which EBP's are in use (re: fidelity concerns)					
6. Please contact us at any time if you have questions or concerns!					

## Appendix 2: DSM codes within Diagnostic Categories

The diagnostic categories used in the gaps analysis generally follows the categories summarized in the Access to Care guidelines for Washington State<sup>10</sup> with some differences. Due to low numbers, *Disorders of Infancy, Childhood, or Adolescence* are not summarized in this report. However, Autism Spectrum Disorders and Pervasive Developmental Disorders are coded as *Pervasive Developmental Disorders* despite not falling under Access to Care eligibility. Because we did not have access to youth information that would qualify level B disorders for Access to Care coverage, we do not distinguish level A and level B disorders in the analyses. Both are included. With the exception of *Pervasive Developmental Disorders*, the other diagnoses represented in the analyses are included in Access to Care standards at either a Level A or Level B.

<b>Unspecified</b>	<b>Diagnosis Deferred 799.9</b> <b>No diagnosis on Axis I or II V71.09</b>
<b>Adjustment Disorders</b>	<b>Adjustment Disorder with Anxiety 309.24</b> <b>Adjustment Disorder with Mixed Anxiety and Depressed Mood 309.28</b> <b>Adjustment Disorder with Depressed mood 309</b> <b>Adjustment Disorder with Disturbance of Conduct 309.3</b> <b>Adjustment Disorder with Mixed Disturbance of Emotions and Conduct 309.4</b> <b>Adjustment Disorder Unspecified 309.9</b> <b>Reactive Attachment Disorder 313.89</b>
<b>Anxiety Disorders</b>	<b>Acute Stress Disorder 308.3</b> <b>Agoraphobia without History of Panic Disorder 300.22</b> <b>Anxiety Disorder Due to Medical Condition 283.89</b> <b>Anxiety Disorder NOS 300</b> <b>Generalized Anxiety Disorder 300.02</b> <b>Obsessive Compulsive Disorder 300.03</b> <b>Panic Disorder with Agoraphobia 300.21</b> <b>Panic Disorder without Agoraphobia 300.01</b> <b>Social Phobia 300.23</b> <b>Specific Phobia 300.29</b> <b>anxiety due to general medical condition 293.84</b> <b>Separation Anxiety disorder 309.21</b>
<b>Trauma</b>	
<b>Bipolar Disorders</b>	<b>Bipolar I Disorder, Most Recent Episode Depressed, Severe Without Psychotic Features 296.53</b> <b>Bipolar I Disorder, Most Recent Episode Depressed, Severe Without Psychotic Features 296.5</b> <b>Bipolar I Disorder, Most Recent Episode Manic, In Full Remission 296.46</b> <b>Bipolar I Disorder, Most Recent Episode Manic, In Partial Remission 296.45</b>

<sup>10</sup> Access to Care Standards (2006). *Eligibility requirements for authorization of services for Medicaid children & youth*. Washington State Healthcare Authority. Olympia, WA.

	<p> <b>Bipolar I Disorder, Most Recent Episode Manic, Mild</b> 296.41  <b>Bipolar I Disorder, Most Recent Episode Manic, Moderate</b> 296.42  <b>Bipolar I Disorder, Most Recent Episode Manic, Severe With Psychotic Features</b> 296.44  <b>Bipolar I Disorder, Most Recent Episode Manic, Severe Without Psychotic Features</b> 296.43  <b>Bipolar I Disorder, Most Recent Episode Manic, Unspecified</b> 296.4  <b>Bipolar I Disorder, Most Recent Episode Mixed, In Full Remission</b> 296.66  <b>Bipolar I Disorder, Most Recent Episode Mixed, In Partial Remission</b> 296.65  <b>Bipolar I Disorder, Most Recent Episode Mixed, Mild</b> 296.61  <b>Bipolar I Disorder, Most Recent Episode Mixed, Moderate</b> 296.62  <b>Bipolar I Disorder, Most Recent Episode Mixed, Severe With Psychotic Features</b> 296.64  <b>Bipolar I Disorder, Most Recent Episode Mixed, Severe Without Psychotic Features</b> 296.63  <b>Bipolar I Disorder, Most Recent Episode Mixed, Unspecified</b> 296.6  <b>Bipolar I Disorder, Most Recent Episode Unspecified</b> 296.7  <b>Bipolar I Disorder, Most Recent Episode Hypomanic</b> 296.4  <b>Bipolar I Disorder, Single Manic Episode, In Full Remission</b> 296.06  <b>Bipolar I Disorder, Single Manic Episode, In Partial Remission</b> 296.05  <b>Bipolar I Disorder, Single Manic Episode, Mild</b> 296.01  <b>Bipolar I Disorder, Singles Manic Episode, Moderate</b> 296.02  <b>Bipolar I Disorder, Single Manic Episode, Severe With Psychotic Features</b> 296.04  <b>Bipolar I Disorder, Single Manic Episode, Severe Without Psychotic Features</b> 296.03  <b>Bipolar I Disorder, Single Manic Episode, Unspecified</b> 296  <b>Bipolar II Disorder</b> 296.89  <b>Cyclothymic disorder</b> 301.13 </p>
<b>Depressive Disorders</b>	<p> <b>Depressive Disorder NOS</b> 311  <b>Dysthymic Disorder</b> 300.4  <b>Major Depressive Disorder, Recurrent, In Full Remission</b> 296.36  <b>Major Depressive Disorder, Recurrent, In Partial Remission</b> 296.35  <b>Major Depressive Disorder, Recurrent, Mild</b> 296.31  <b>Major Depressive Disorder, Recurrent, Moderate</b> 296.32  <b>Major Depressive Disorder, Recurrent, Severe With Psychotic Features</b> 296.34  <b>Major Depressive Disorder, Recurrent, Severe Without Psychotic Features</b> 296.33  <b>Major Depressive Disorder, Recurrent, Unspecified</b> 296.3  <b>Major Depressive Disorder, Single Episode, In Full Remission</b> 296.26  <b>Major Depressive Disorder, Single Episode, In Partial Remission</b> 296.25  <b>Major Depressive Disorder, Single Episode, Mild</b> 296.21  <b>Major Depressive Disorder, Single Episode, Moderate</b> 296.22  <b>Major Depressive Disorder, Single Episode, Severe With Psychotic Features</b> 296.24  <b>Major Depressive Disorder, Single Episode, Severe Without Psychotic Features</b> 296.23 </p>

	<b>Major Depressive Disorder, Single Episode, Unspecified 296.2</b> <b>Mood Disorder Due to Medical Condition 293.83</b> <b>Mood Disorder NOS 296.9</b>
<b>Psychotic Disorders</b>	<b>Brief Psychotic Disorder 298.8</b> <b>Unspecified Emotional Disturbance of childhood or adolescence 313.9</b> <b>Delusional Disorder 297.1</b> <b>Psychotic Disorder Due to Medical Condition, with Delusions 293.81</b> <b>Psychotic Disorder Due to Medical Condition, with Hallucinations 293.82</b> <b>Psychotic Disorder, NOS 298.9</b> <b>Schizoaffective Disorder 295.7</b> <b>Schizoid Personality Disorder 301.2</b> <b>Schizophrenia, Catatonic Type 295.2</b> <b>Schizophrenia, Disorganized Type 295.1</b> <b>Schizophrenia, Paranoid Type 295.3</b> <b>Schizophrenia, Residual Type 296.6</b> <b>Schizophrenia, Undifferentiated Type 295.9</b> <b>Shared Psychotic Disorder 297.3</b> <b>schizophreniform d/o 295.4</b> <b>Disorganized type schizophrenic, chronic 295.12</b> <b>Catatonic type schizophrenia, subchronic 295.21</b> <b>schizophrenia, paranoid type, subchronic 295.31</b>
<b>Pervasive Developmental Disorders</b>	<b>Autism Spectrum Disorder 299</b> <b>Pervasive Developmental Disorder, NOS 299.8</b>
<b>Attention-Deficit Disorders</b>	<b>Attention-Deficit Hyperactivity Disorder, Combined Subtype 314.01</b> <b>Attention-Deficit Hyperactivity Disorder, Hyperactive-Impulsive Subtype 314.01</b> <b>Attention-Deficit Hyperactivity Disorder, Inattentive Subtype 314</b> <b>Attention-Deficit Hyperactivity Disorder NOS 314.9</b>
<b>Conduct Disorders</b>	<b>Conduct disorder 312.8</b> <b>Conduct Disorder, Childhood Onset 312.81</b> <b>Conduct Disorder, Adolescent Onset 312.82</b> <b>Conduct Disorder, Unspecified Onset 312.89</b> <b>Oppositional Defiant Disorder 313.81</b> <b>Disruptive Behavior Disorder NOS 312.9</b> <b>Undersocialized Conduct Disorder, aggressive type, unspecified 312</b> <b>Impulse Control Disorder, unspecified 312.3</b> <b>Intermittent Explosive Disorder 312.34</b>
<b>Personality Disorders</b>	<b>Obsessive Compulsive Personality Disorder 301.4</b> <b>Borderline Personality disorder 301.83</b> <b>Unspecified personality disorder 301.9</b>
<b>Eating Disorders</b>	<b>Anorexia nervosa 307.1</b> <b>Eating Disorder NOS 307.5</b> <b>Bulimia Nervosa 307.51</b>
<b>Substance-Abuse Disorders</b>	<b>Substance Intoxication 292.89</b> <b>Cannabis Abuse d/o 305.2</b> <b>Cannabis Dependence Disorder 304.3</b>

	<p> <b>Substance-Induced Psychotic Disorder, With Delusions</b> 292.11  <b>Substance-Induced Psychotic Disorder, With Hallucinations</b> 292.12  <b>Sleep/sexual dysfunction</b> 291.8  <b>Intoxication delirium</b> 291  <b>Related disorder NOS</b> 292.9  <b>Withdrawal</b> 292  <b>Intoxication delirium</b> 292.81  <b>Caffeine intoxication/Inhalant abuse</b> 305.9  <b>Cocaine abuse</b> 305.6  <b>Cocaine dependence</b> 304.2  <b>Cocaine/Hallucinogen induced mood d/o</b> 292.84  <b>Hallucinogen abuse</b> 305.3  <b>Hallucinogen dependence</b> 304.5  <b>Inhalant dependence</b> 304.6 </p>
<p><b>Alcohol-Use Disorders</b></p>	<p> <b>Alcohol Abuse</b> 305  <b>Alcohol Dependence</b> 303.9  <b>Induced Anxiety d/o and induced mood d/o</b> 291.8  <b>Induced Persisting Amnesiac d/o</b> 291.1  <b>Induced Persisting dementia</b> 291.2  <b>Induced Psychotic d/o with delusions</b> 291.5  <b>Induced Psychotic d/o with hallucinations</b> 291.3  <b>Intoxication</b> 303  <b>Intoxication delirium</b> 291  <b>Related disorder NOS</b> 291.9  <b>Withdrawal</b> 291.8 or 291.81  <b>Cocaine</b>  <b>Abuse</b> 305.6  <b>Dependence</b> 304.2  <b>Induced anxiety disorder</b> 292.89  <b>Induced mood disorder</b> 292.84  <b>Induced psychotic disorder with delusions</b> 292.11  <b>Induced psychotic disorder with hallucinations</b> 292.12  <b>Induced sexual dysfunction</b> 292.89  <b>Intoxication</b> 292.89  <b>Intoxication delirium</b> 292.81  <b>Related disorder NOS</b> 292.9  <b>Withdrawal</b> 292  <b>Hallucinogen</b>  <b>Abuse</b> 305.3  <b>Dependence</b> 304.5  <b>Induced anxiety disorder</b> 292.89  <b>Induced mood disorder</b> 292.84  <b>Induced psychotic disorder, with delusions</b> 292.11  <b>Induced psychotic disorder with hallucinations</b> 292.12  <b>Intoxication</b> 292.89  <b>Intoxication delirium</b> 292.81  <b>Related disorder NOS</b> 292.9 </p>

<p><b>Inhalant</b>  <b>Abuse</b> 305.9  <b>Dependence</b> 304.6  <b>Induced anxiety disorder</b> 292.89  <b>Induced mood disorder</b> 292.84  <b>Induced psychotic disorder, with delusions</b> 292.11  <b>Induced psychotic disorder with hallucinations</b> 292.12  <b>Intoxication delirium</b> 292.81  <b>Related disorder NOS</b> 292.9</p> <p><b>Opioid</b>  <b>Abuse</b> 305.5  <b>Dependence</b> 304  <b>Induced mood disorder</b> 292.84  <b>Induced psychotic disorder, with delusions</b> 292.11  <b>Induced psychotic disorder with hallucinations</b> 292.12  <b>Induced Sleep Disorder</b> 292.89  <b>Intoxication</b> 292.89  <b>Intoxication delirium</b> 292.81  <b>Related disorder NOS</b> 292.9</p> <p><b>Withdrawal</b> 292</p> <p><b>Phencyclidine</b>  <b>Abuse</b> 305.9  <b>Dependence</b> 304.9  <b>Induced anxiety disorder</b> 292.89  <b>Induced mood disorder</b> 292.84  <b>Induced psychotic disorder, with delusions</b> 292.11  <b>Induced psychotic disorder with hallucinations</b> 292.12  <b>Intoxication</b> 292.89  <b>Intoxication delirium</b> 292.81  <b>Related disorder NOS</b> 292.9</p> <p><b>Cannabis</b>  <b>Abuse</b> 305.2  <b>Dependence</b> 304.3  <b>Induced anxiety disorder</b> 292.89  <b>Induced psychotic disorder, with delusions</b> 292.11  <b>Induced psychotic disorder with hallucinations</b> 292.12  <b>Intoxication</b> 292.89  <b>Intoxication delirium</b> 292.81  <b>Related disorder NOS</b> 292.9</p> <p><b>Caffeine &amp; Nicotine</b>  <b>Induced Anxiety disorder</b> 292.89  <b>Induced Anxiety disorder</b> 292.89  <b>Intoxication</b> 305.9  <b>Related disorder NOS</b> 292.9</p> <p><b>Nicotine</b>  <b>Dependence</b> 305.1  <b>Withdrawal</b> 292</p>
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	<p><b>Nightmare disorder 307.47</b>  <b>No Diagnosis on Axis II V71.09</b>  <b>No Diagnosis or Condition on Axis I V71.09</b>  <b>Noncompliance With Treatment V15.81</b>  <b>Occupational Problem V62.2</b>  <b>Related Disorder NOS 292.9</b></p>
<b>Drug-Use Disorders</b>	<p><b>Amphetamine Abuse 305.7</b>  <b>Dependence 304.4</b>  <b>Induced anxiety disorder 292.89</b>  <b>Induced mood disorder 292.84</b>  <b>Induced psychotic disorder, with delusions 292.11</b>  <b>Induced psychotic disorder with hallucinations 292.12</b>  <b>Induced sexual dysfunction/induced sleep disorder 292.89</b>  <b>unspecified nonpsychotic mental disorder 300.9</b>  <b>Gender Identity Disorder 302.85</b>  <b>Tourette's Disorder 307.23</b>  <b>Stereotypic Movement disorder 307.89</b>  <b>Other and Unspecified special symptoms or syndromes, not elsewhere classified 307.9</b>  <b>Trichotillomania 312.39</b>  <b>Selective Mutism 313.23</b>  <b>Identity Disorder of childhood or adolescence 313.82</b>  <b>Expressive Language Disorder 315.31</b>  <b>Mixed Receptive expressive Language disorder 315.32</b>  <b>Unspecified extrapyramidal disease and abnormal movement disorder 333.9</b>  <b>Cachexia 799.4</b>  <b>Child Sexual Abuse 995.53</b>  <b>Counseling for Parent - child problem, unspecified V61.20</b>  <b>Other specified family circumstances V61.8</b>  <b>Relational Problem NOS V61.81</b>  <b>Bereavement, uncomplicated V62.82</b></p>
<b>Dx not Indicated</b>	<p><b>cholera due to vibrio cholera 1</b>  <b>conversion disorder 300.11</b>  <b>Unspecified transient mental d/o in conditions classified elsewhere 293.9</b>  <b>Unspecified transient mental d/o due to conditions classified elsewhere 294.9</b>  <b>Dissociative Identity disorder 300.14</b>  <b>Dissociative disorder or reaction, unspecified 300.15</b>  <b>Other and unspecified factitious illness 300.19</b>  <b>undifferentiated somatoform disorder 300.82</b></p>



### Appendix 3: R/EBP Program Coding

Practices were coded as A = strong support, B = moderate support and C = strong support but not on inventory. Decisions about the strength of support were made by reviewing the studies included in the Washington State Institute for Public Policy’s meta-analytic reviews and studies identified by our research staff and cross-walking the population of focus with the diagnostic categories. Studies had to explicitly demonstrate improvement in the diagnostic domains to be listed in an A category. For example, while CBT+ is considered well-indicated for Anxiety, Depression and Trauma, because no studies explicitly study effects on Adjustment Disorder, CBT+ is listed a B level practice in this domain despite considerable overlap in presenting symptoms. Additionally, generic CBT is listed as a B category for multiple domains for which CBT is effective because it is unclear whether non-manualized CBT can achieve the same levels of effect as manualized versions. It is also less clear what type of training therapists may have received in generic CBT while for other, manualized programs a specific training protocol had to be implemented.

Diagnostic Category	MATCH	CBT+	CBT (No further specificity)	CBT for Anxious Children	CBT for Depressed Adolescents	Family-Focused Treatment for Adolescents	Multifamily Psycho-educational Groups for Bipolar DO	MFT for Psychosis	CBT Based Models for Child Trauma	EMDR	Family-Based Therapy for Eating Disorders	CBT for Parents with Anxious Children	Behavioral Parent Training for Children w/Disruptive Bx Disorders	PCIT	Triple P Level 4	FFT	Incredible Years Parent Training	MST	Adolescent Community Reinforcement Approach	Bx Parent Training for Children w/ADHD	Multimodal Treatment for ADHD	Full Fidelity Wraparound	ABA	PEERS	
Adjustment Disorders	B	B	B																			B			
Anxiety Disorders	A	A	B	A								A													
Bipolar Disorders						C	C																		
Depressive Disorders	A	A	B		A																				
PTSD			B						A	A															
Psychotic Disorders								C																	
Attention Deficit Disorders																					A		A		
Conduct Disorders	A	A											A	A	A	B	A	B							
Personality Disorders																									
Eating Disorders											C														
Substance Abuse Disorders																		A							
Alcohol Use Disorders																		A	A						
Pervasive Developmental Disorders																								C	C

o Based on the following criteria:

- (A)Established: Evidence-based or research-based by WSIPP specifically for this diagnostic category. References not provided—Available from WSIPP
- (B) Likely: Evidence-based or research-based by WSIPP generally, and appears likely to be applicable to this diagnostic category

References not provided—Available from WSIPP

- (C) Provisional: Supported by evidence that has not yet been reviewed by WSIPP

References provided below

If the agency indicated that training on a program was agency-wide and the same number of therapists were trained in multiple programs, the number of therapists trained for that diagnostic category was taken from the agency-wide figure. For example, if the agency indicated they received agency-wide training for 20 therapists in Trauma-Focused CBT and CBT+ (which contains a trauma module), we assigned the agency 20 therapists as practicing a trauma indicated R/EBP. If the agency did not indicate that training was agency-wide and reported 5 therapists being trained in TF-CBT and 3 therapists being trained in CBT+, we assigned the agency 8 therapists as practicing a trauma indicated R/EBP.

## Appendix 4: Geocoding Calculations

### Introduction

Mental health services are needed by individuals whose residences are distributed across space. Mental health service providers, on the other hand, are located at fixed points. Therefore, in order for persons seeking treatment to obtain treatment, some travel is involved.

In places where a relatively large number of providers are located, there may be more service available than needed by the underlying population. Where there are relatively few or no providers, services may be inadequate or nonexistent. These areas of relatively low service can be considered gaps or “mental health service deserts.” This terminology is borrowed from the literature on food deserts (Aggarwal et al., 2014; Jiao, Moudon, Ulmer, Hurvitz, & Drewnowski, 2012; Ploeg et al., 2009). The Farm Bill’s definition is an “area in the United States with limited access to affordable and nutritious food, particularly such an area composed of predominantly lower income neighborhoods and communities” (Title VI, Sec. 7527). A fundamental difference exists between food service providers, such as grocery stores and supermarkets, versus mental health service providers. Whereas the former offers a large variety and virtually unlimited supplies of foods, the latter is limited in service capacity, both in the variety of therapeutic treatment services offered (e.g., depression, substance abuse, PTSD) and the level of service, due to staffing constraints. For this reason, quantifying the relative capacity across space is important in determining overall levels of service, and whether such services are capable of meeting the needs of underlying populations.

“Catchment” or “service areas” can be created, using geographic information systems (GIS) network analysis, for each service provider based on assumptions of the time or distance seekers are willing to travel to obtain service. Using the number of providers for each service area, and under assumptions about the number of clients a provider can treat per year, it is possible to develop a count of patients per unit area per year for each service area. A complication is that agencies that are located near to each other will have overlapping service areas. The method developed in this study accounts for additive counts in these overlap areas using raster map algebra analysis.

Having created a raster (grid) with summed patient counts per cell, summaries can be made using administrative unit polygons to estimate the total treatment capacity per administrative unit, or portion of administrative unit, covered by the service areas. These capacities can then be compared to prevalence rates to identify locations with a surplus or dearth in treatment supply.

Agency data included facility name, address, and the count of therapists offering services for ADHD, adjustment disorder, alcohol abuse, anxiety, bipolar disorder, conduct disorder, depression, eating disorders, pervasive developmental disorders, personality disorders, psychotic disorder, substance abuse, and/or trauma.

The 111 agency addresses were geocoded using ArcGIS 10.2.2 (ESRI, 2014) with Esri StreetMap USA Premium as reference data, to rooftop level accuracy. The minimum acceptable match score was 100 (65% of addresses matched automatically with this accuracy); those failing to match automatically were manually rematched either by correcting address errors or picking map locations using additional address locators in ArcGIS or by finding addresses using Google Maps.

### Service area calculation

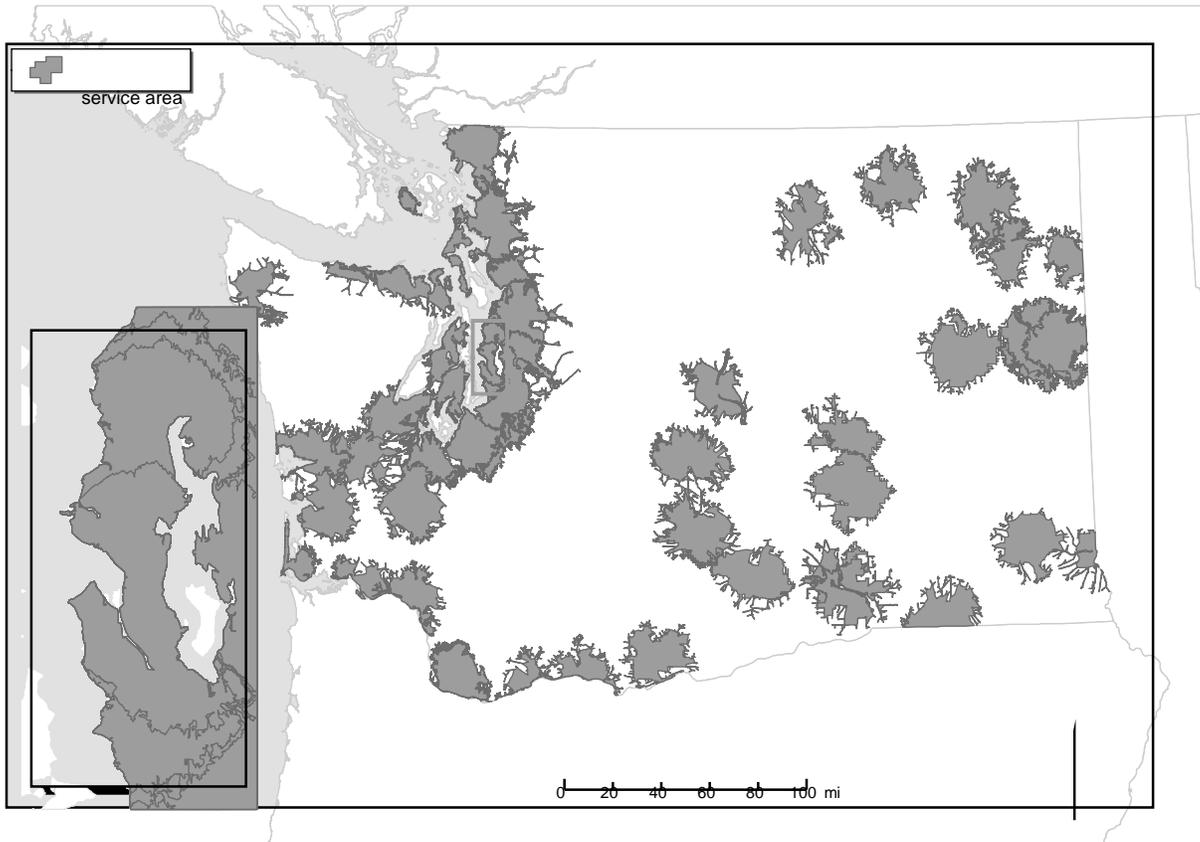
Each agency was assigned a travel distance of either 10 or 20 mi (i.e., the distance that a patient would be willing to travel to obtain services); most agencies within the City of Seattle were assigned 10 mi travel distance, with the remainder assigned 20 mi (Figure ). Service areas were generated in ArcGIS using StreetMap USA data (which is encoded for traversability via different travel modes), configured to allow travel by walking, bus, motorcycle, taxi, and car, while avoiding ferries.

Service areas were generated in ArcGIS using StreetMap USA. The service areas, limited to Washington State, are shown in 5. First, we identified the geographical boundaries of feasible service areas for each mental health agency. With the exception of 15 agencies in urban King County, all agency boundaries were set to serve 20 miles in any direction. The 15 agencies in King County were set to 10 miles to account for the increased time to travel due to higher congestion. These distances were selected to provide a clear picture of areas in the state where a client cannot get to treatment in approximately 30 minutes.

The 111 agency addresses were geocoded using ArcGIS 10.2.2 (ESRI, 2014) with Esri StreetMap USA Premium as reference data, to rooftop level accuracy. The minimum acceptable match score was 100 (65% of addresses matched automatically with this accuracy); those failing to match automatically were manually rematched either by correcting address errors or picking map locations using additional address locators in ArcGIS or by finding addresses using Google Maps.

**Figure 5: Location of agencies responding to survey; inset shows detail of the Seattle area**

**Figure 6: Service areas in 20 miles distances, 10 miles in King County (inset) for study agencies (n = 111)**



The adequacy of each service area to meet need within that area was calculated by estimating therapist number and patient need in 300 square foot “cells.” These cell counts were then summed to make up each service area’s estimate of capacity (see Appendices for calculations). Within diagnostic categories, patient need was summed for each zip code area and therapist capacity was estimated for each zip code area based on the agency address and the formula for estimating caseload provided in the procedures section. The difference score is displayed on the maps to demonstrate the amount of excess or unmet capacity visualized in 10 and 20 miles distances. In the maps, service area excess is overlaid on a map of patient need for the state (in grayscale). This provides a visualization of where patient need exists and how well it is being addressed in service areas of existing agencies. Areas on the map with no service areas indicate no services exist to meet need. The darker shades of gray indicate more patient need in numbers of youth. Colored areas indicate the presence of services and the adequacy of those services to meet need in numbers of youth in excess (positive) or deficit (negative). Values around zero indicates that needs are being met in the colored service areas.

Maps for psychotic disorders, eating disorders and bipolar disorder are not shown because no R/EBPs were reported for these disorders; consequently, service areas could not be calculated. The estimated capacity numbers per RSN in Table 10 illustrates the number of youth with these needs in each area.

Geocoded Maps

### Estimation of patient capacity

In many locations, service areas overlapped when agencies were within several miles of each other, as shown in Figure 1. The area of overlap could serve more patients per unit area than non-overlapped areas. In locations with highly clustered agencies, such as Seattle, multiple service areas overlapped in many locations. Therefore, proper quantification of these overlapping areas was important for estimating a spatially explicit level of service. It should be noted that this method assumes that capacity is uniformly distributed across the service area (i.e., that persons residing at the periphery are equally well served as those residing close to the agency itself).

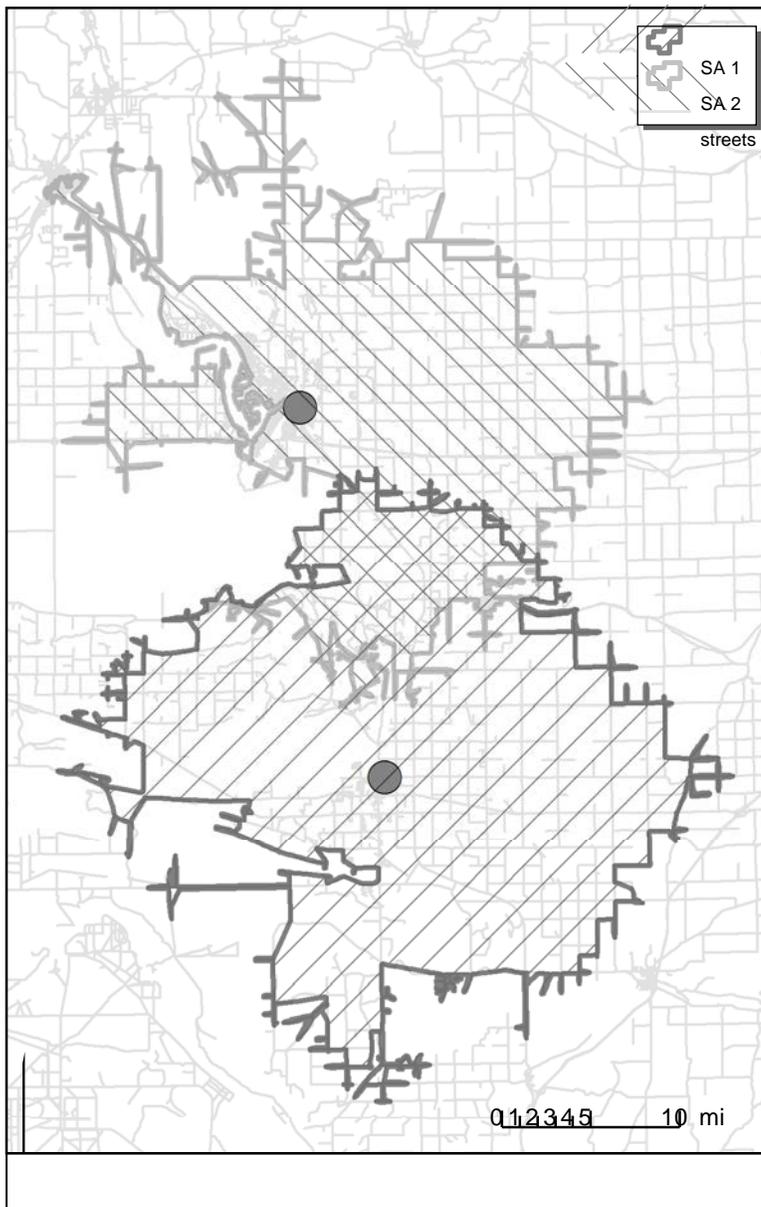


Figure 1: Two overlapping service areas; dots indicate agency address location

The topological polygon-overlay techniques in GIS are appropriate for situations in which polygonal geometries overlap. However, with relatively large numbers of geometrically complicated features, software frequently becomes overwhelmed. Furthermore, keeping track of the many new geometric features introduced in multiple overlay operations is quite difficult; each new polygonal sliver must be tracked—the ratio of each new sliver’s area with respect to the parent polygon areas must be used to estimate the area-proportionate capacity.

Rather than using topological overlays, the additive patient counts were quantified using raster “overlay” techniques. In this analytic framework, each service area is treated as a collection of cells; each cell is assigned a patient count as  $(n \text{ patients} / n \text{ cells})$ . Summing all cells within each service area raster results in the original count of patients in the service area. However, the cell values from any spatial subset of cells can also be summed to generate an estimate of the patient counts within that spatial subset (for example, summing by ZIP code areas). Furthermore, adding “layers” of overlapping service area rasters simply sums for each cell location the per-cell patient counts from each component service area. This analytic framework greatly simplifies the estimation of the patient counts in overlapping areas.

As a conceptual analogy for this process, imagine that the number of patients able to be serviced is represented as a volume of clay. The clay is spread out evenly across the service area. Another service area’s patient capacity is converted to a volume of clay and spread out evenly across its extent. Where the two service areas overlap, the clay becomes thicker proportionate to the total capacity in the overlapped area.

The resultant raster formed by summation across all service areas can then be used to generate estimates of patient capacity for any polygonal pre-defined administrative areas, such as census polygons or ZIP code areas.

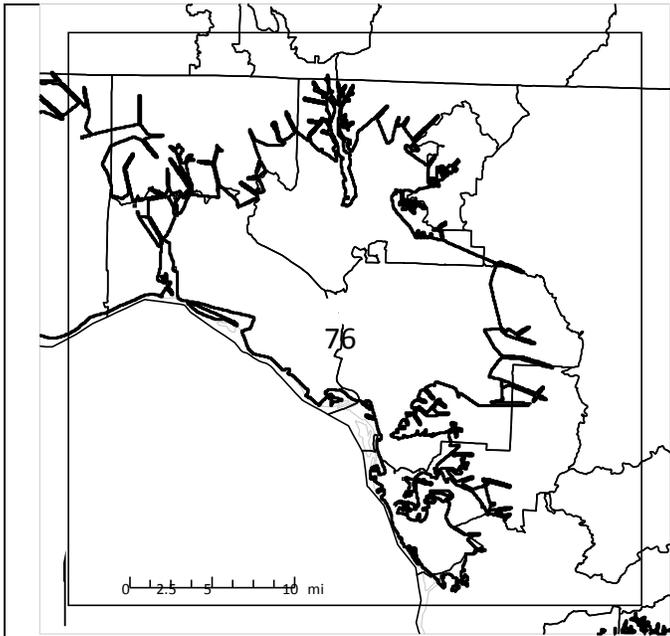
To achieve this, service area polygon data were converted to separate rasters in PostGIS (The PostGIS Development Group, 2008) with a cell size of 300 ft. A “base” raster consisting of values of zero was used, to which each service area raster was added iteratively, using the `ST_MapAlgebra` function.

#### Diagnostic counts

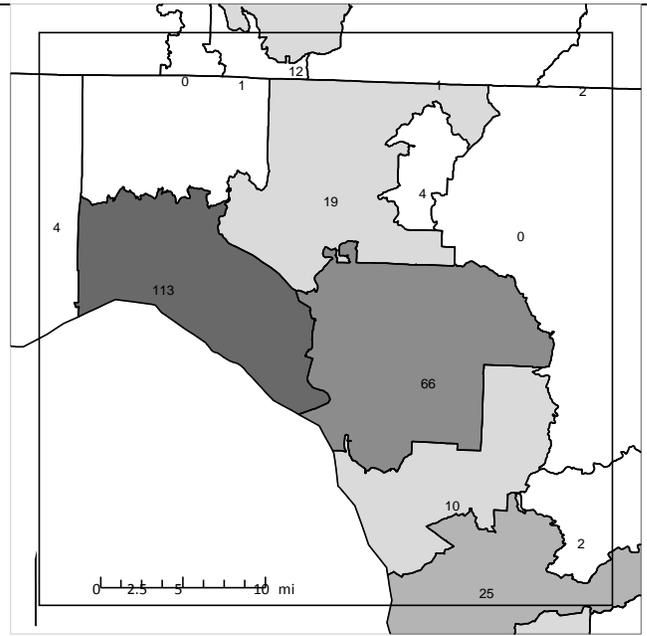
The count of patients diagnosed with each condition by ZIP code was summed from lists of individual patients on a ZIP code basis. It should be noted that this method assumes that diagnostic counts are uniformly distributed across the ZIP code area, which is especially unlikely in more rural areas.

#### Estimation of deficit/surplus

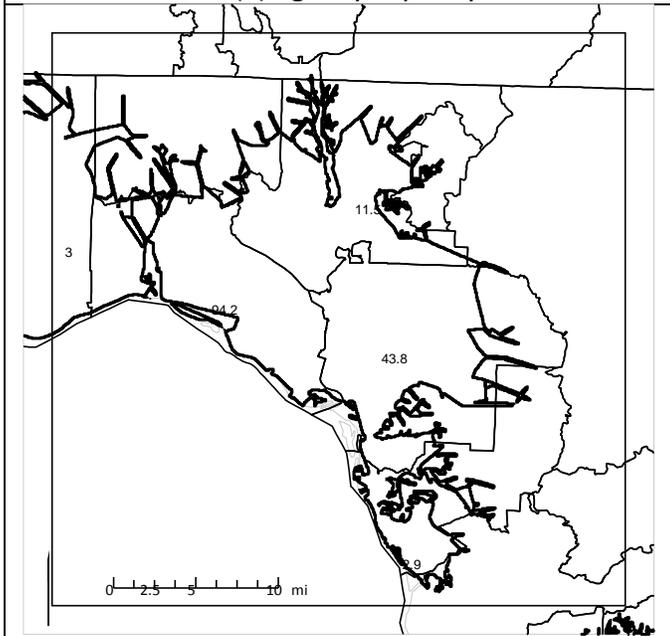
To estimate whether levels of service meet or do not meet diagnostic needs, combined service area rasters were intersected with diagnostic need ZIP code areas. This resulted in a separate polygon for each overlap between a service area and a ZIP code area. The proportion of area of this new polygon and the original ZIP code polygon was used as a multiplier to determine the count of patients in the sub-area. Similarly, the count of patients able to be served was calculated using the area proportions of service area sub-polygons. The sequence is somewhat complicated and best explained with a graphical example (Figure 2). The analysis was performed using the `ST_Clip` raster function in PostGIS.



(a) agency capacity

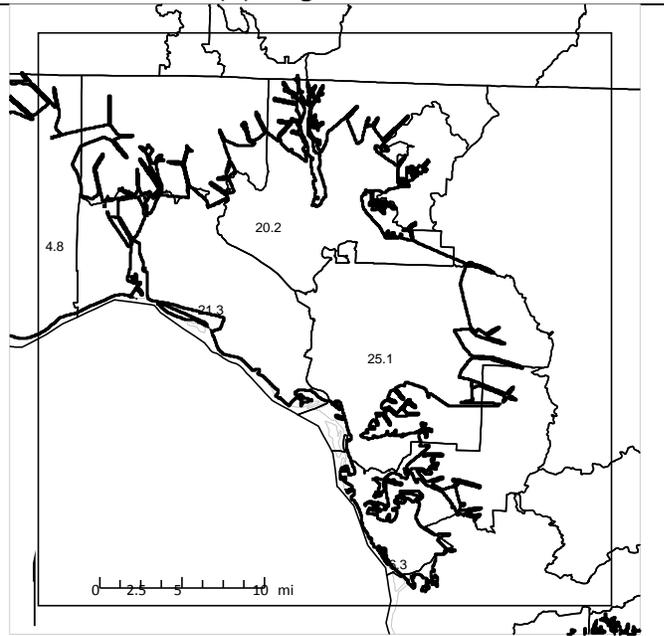


(b) diagnostic count



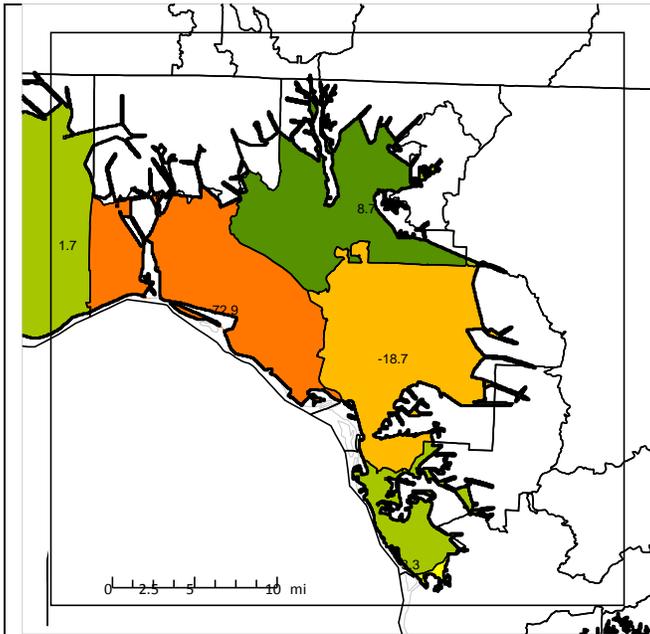
area weighted diagnostic count

(c)



area-weighted service

(d)



(e)

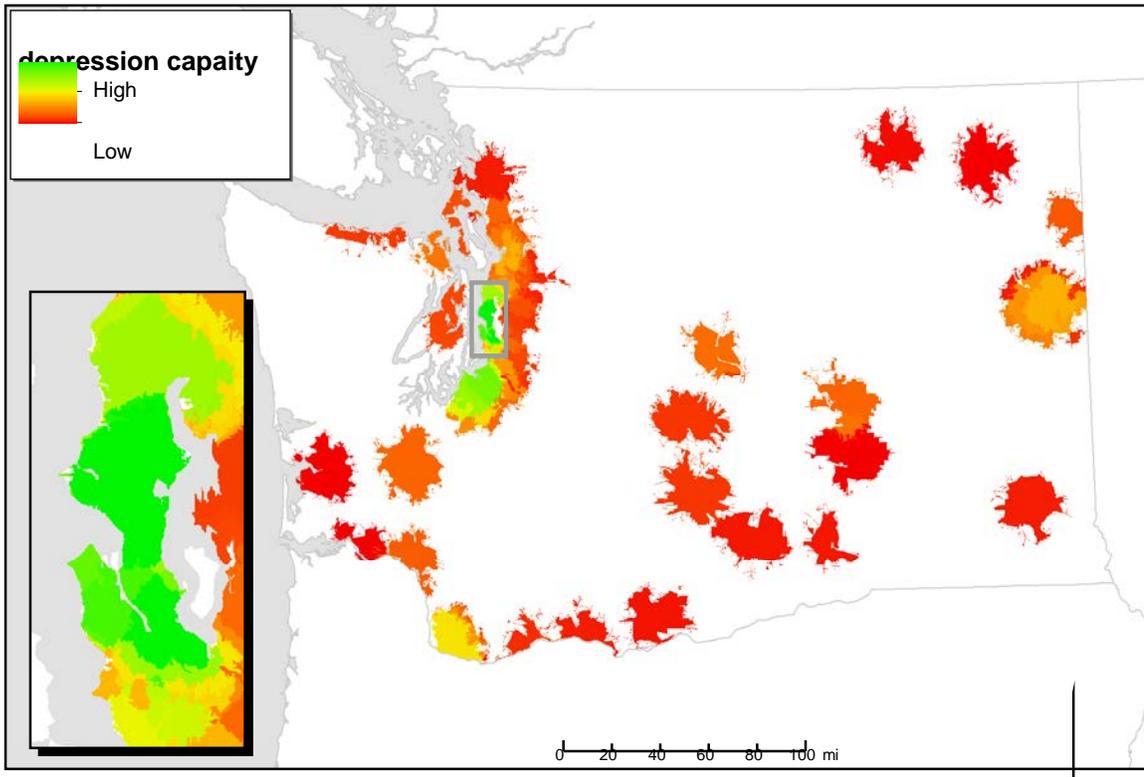
deficit/surplus

Figure 2: Overlay proportions for depression

- (a) This agency can serve 76 patients
- (b) ZIP code areas show the count of diagnoses
- (c) Each intersected 'chunk' of service and ZIP code area shows the area-weighted proportion of diagnostic count
- (d) Each intersected 'chunk' of service and ZIP code area shows the area-weighted proportion of patients able to be served
- (e) Service – need = deficit or surplus

## Results

A resultant capacity raster generated for the service areas for depression is shown in Figure 3. The service areas are shown in color, with greatest capacity in green and lowest capacity in red; highest levels of service are in the Seattle-Tacoma-Olympia corridor.



## Appendix 5

A map showing both rates of diagnosis and level of service for depression is shown in Figure 4. Diagnostic counts are indicated in shades of grey, and deficit/surplus is shown in color. Red and orange areas have the greatest deficit, whereas green areas have the greatest surplus. Grey areas represent ZIP code areas that are beyond agency service areas, but that have diagnostic counts that is not being met by R/EBPs. Hatched areas represent those ZIP code areas that did not have a match between the diagnostic count data and the ZIP code polygon data.

Colors with red saturation indicate unmet needs while colors with increasing green saturation indicate more capacity than need for those areas. A value close to zero indicates that agency capacity perfectly meets the level of treatment need. White areas of the map indicate 0-8 youth per area with that diagnostic need. Areas with diagonal hatch marks indicate no youth with a history of mental health service in FY2013. The location of mental health agencies are indicate by a plus sign (+) or a zero (0). The plus sign indicates an agency with at least one R/EBP for that diagnostic category. A zero sign indicates the location of an agency with no R/EBP for that diagnostic category. In cases of missing data, where we received no response from an agency, the agency is coded as having no R/EBP (0).

Zones		Capacity Estimates*
R/EBPs present	No R/EBPs present	Unmet need in estimated youth (annually)
Red	Gray 1	> 80
Dark orange	Gray 2	40-80
Orange	Grays 3 & 4	5-40
Yellow	White	0-5
		Excess capacity in estimated youth (annually)
Light green		1-5
Med green		5-20
Dark green		> 20

\*The capacity ranges of the aligned color and gray zones (e.g., Red and Gray 1) do not perfectly match. The ranges given in the table are taken from the color categories.

