



# Big Data ► Big Discoveries!

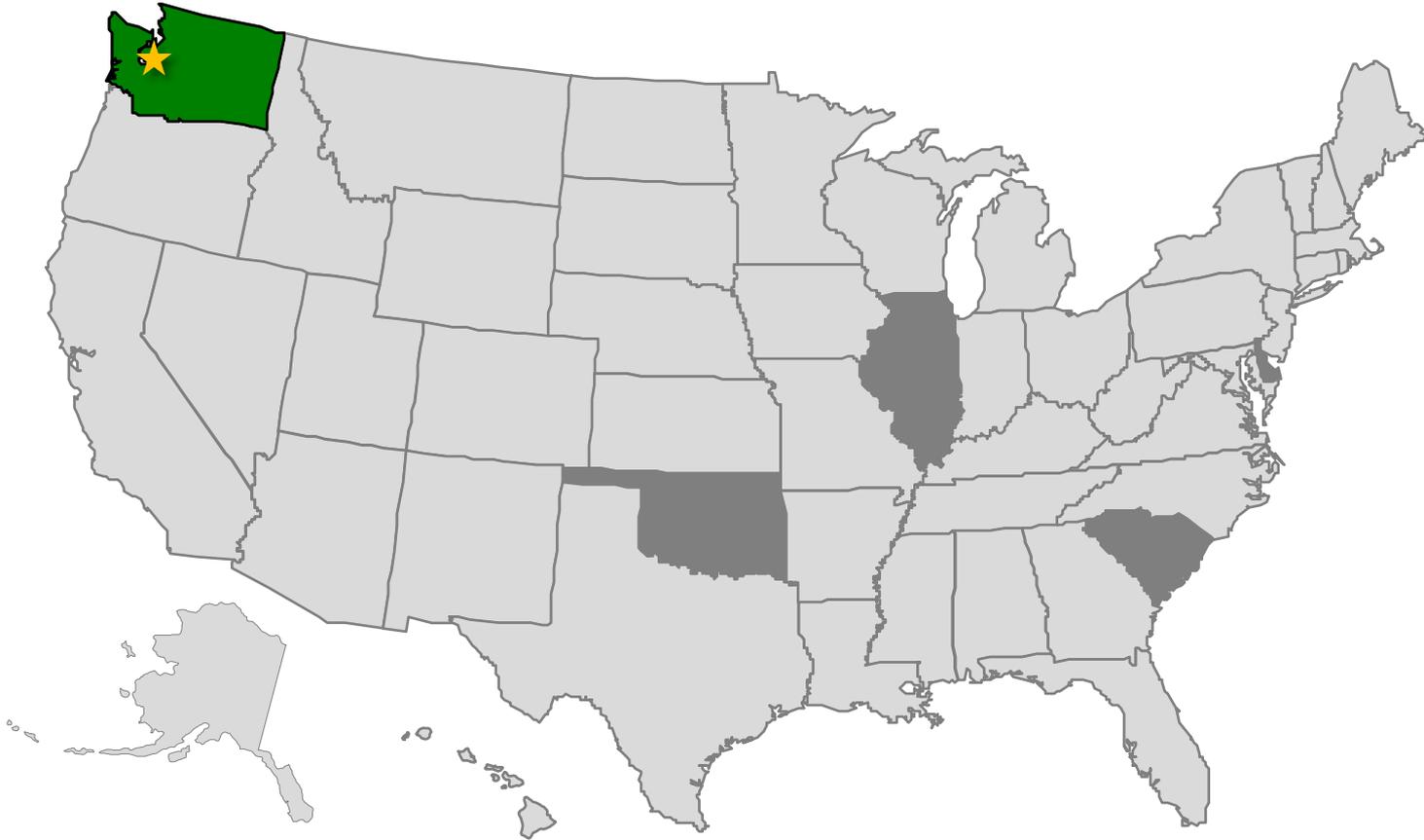
Revealing patterns of behavior and outcomes  
using advanced analytical capabilities  
and predictive modeling

**Jody Becker-Green, PhD**

Washington State Department of Social and Health Services  
Planning, Performance and Accountability

AUGUST 28, 2012  
RDA REPORT NUMBER 11.180

# Washington is one of a few states in the nation with an integrated social service client database



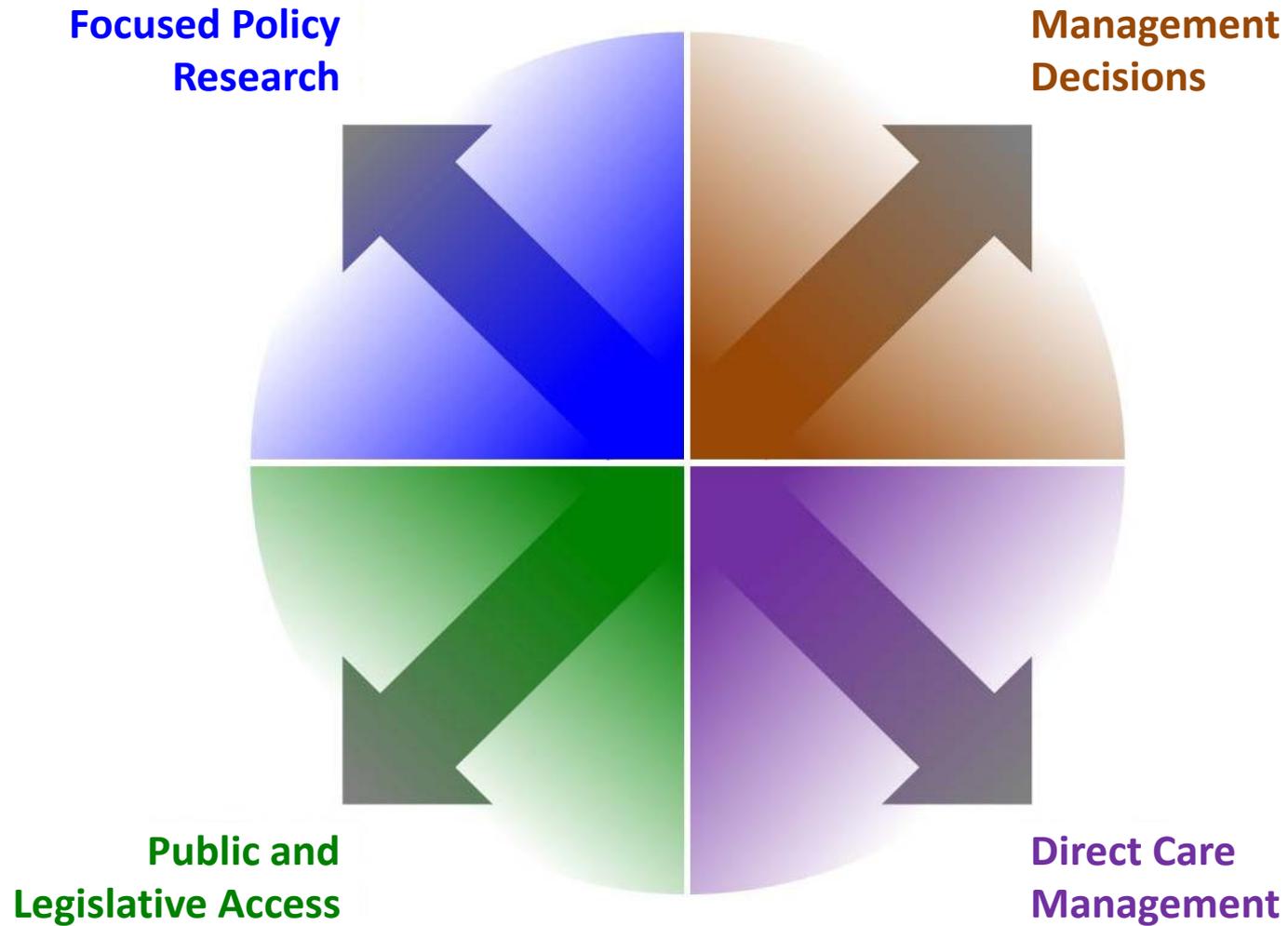
**That means we can identify costs, risks and outcomes  
at the state or community level . . . .**



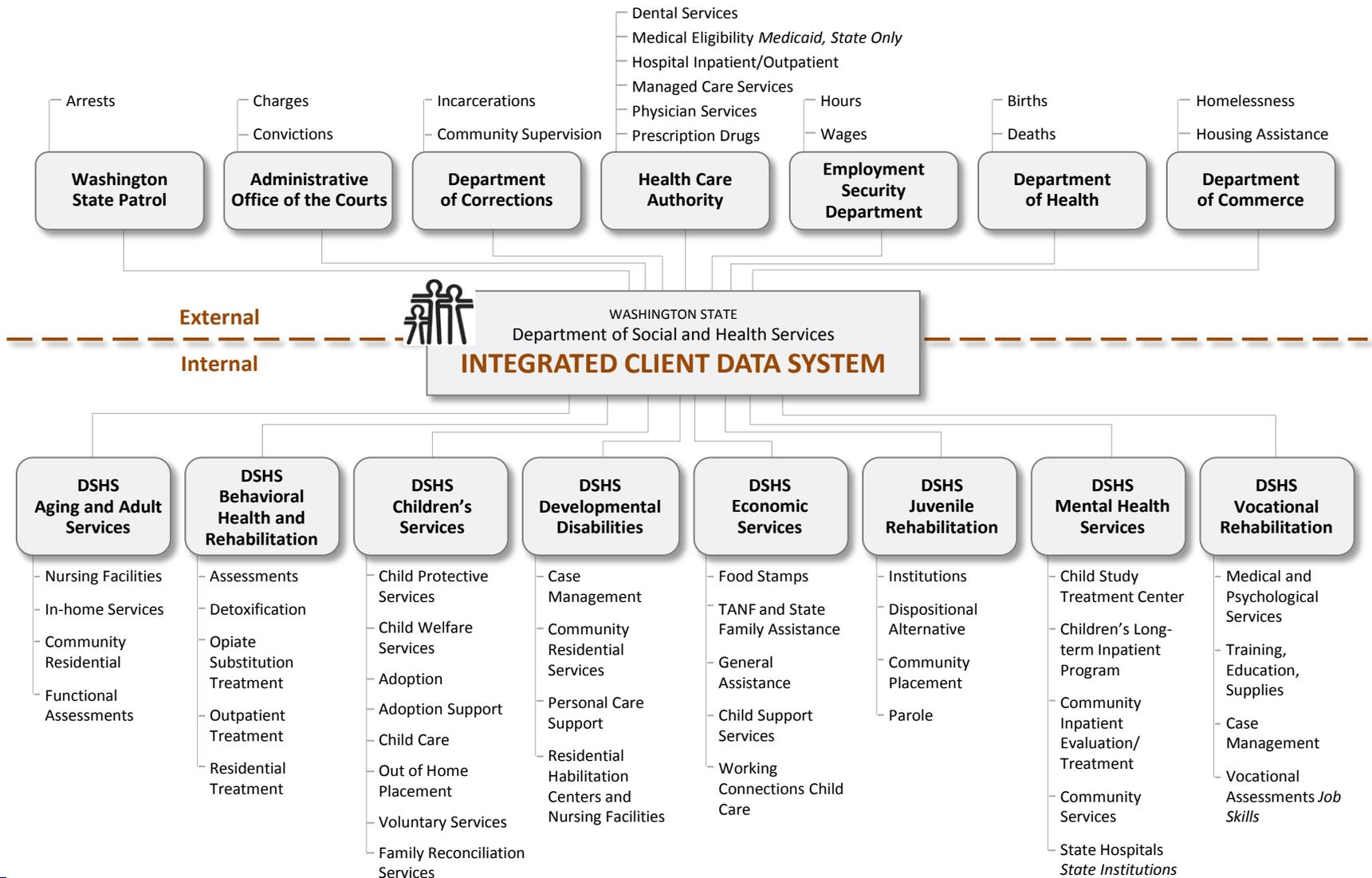
**. . . and at an individual or family level**



# The data inform internal and external decisions

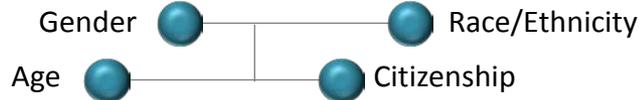


# The data is now linked to other sources of information, like crime, incarceration, school, and employment data

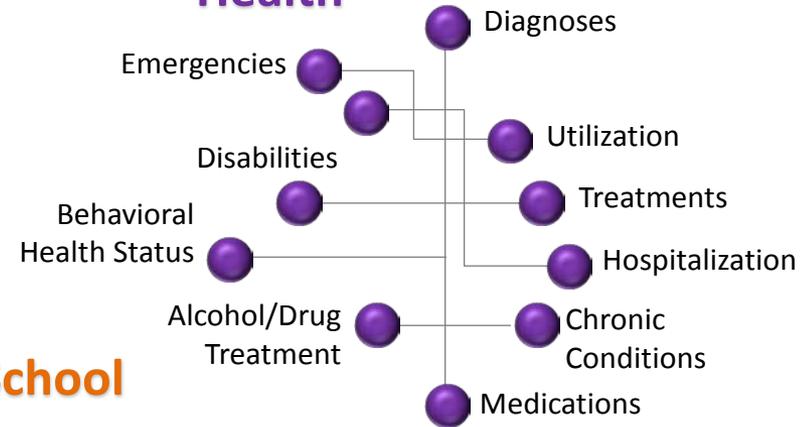


# Very detailed indicators allow us to identify risk and outcomes

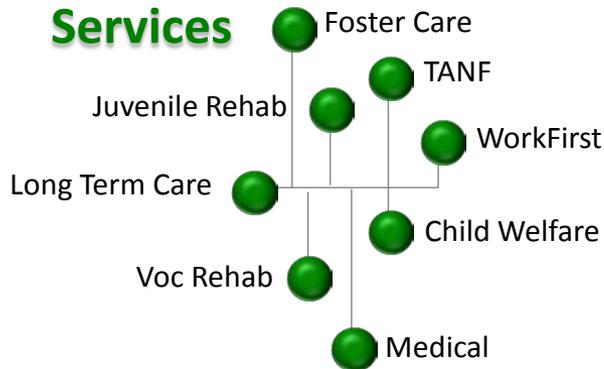
## Demographics



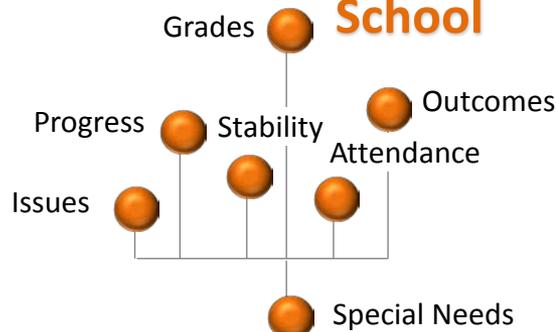
## Health



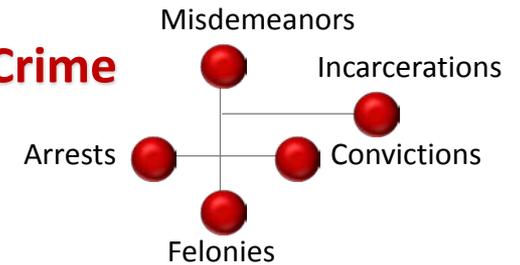
## Services



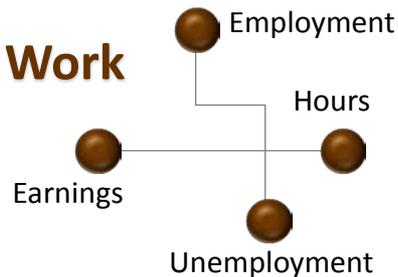
## School



## Crime



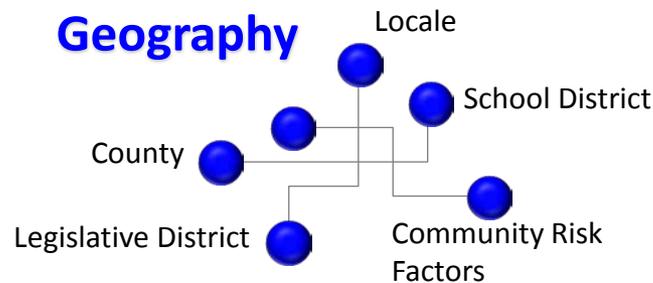
## Work



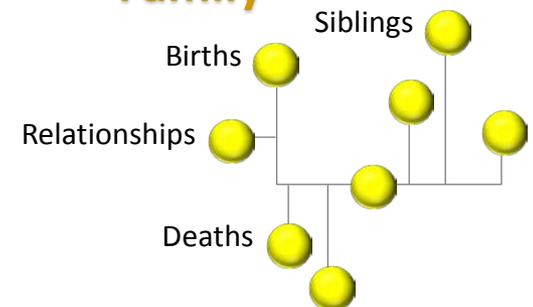
## Housing



## Geography

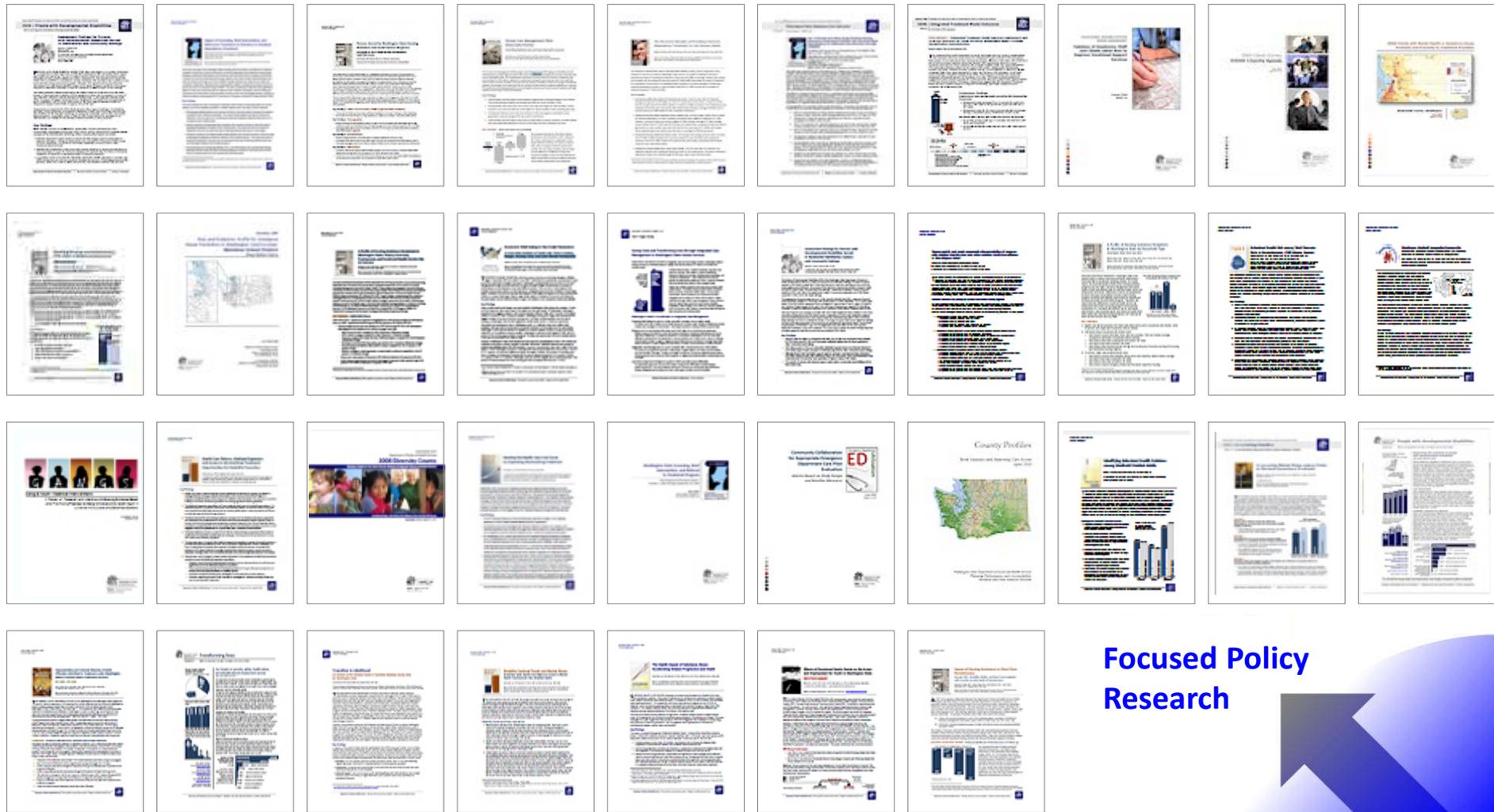


## Family

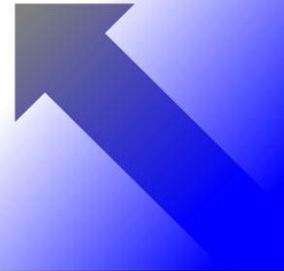


# Focused policy research informs state and national policy

— Hundreds of formal, in-depth studies —



Focused Policy  
Research



<http://www.dshs.wa.gov/rda/>

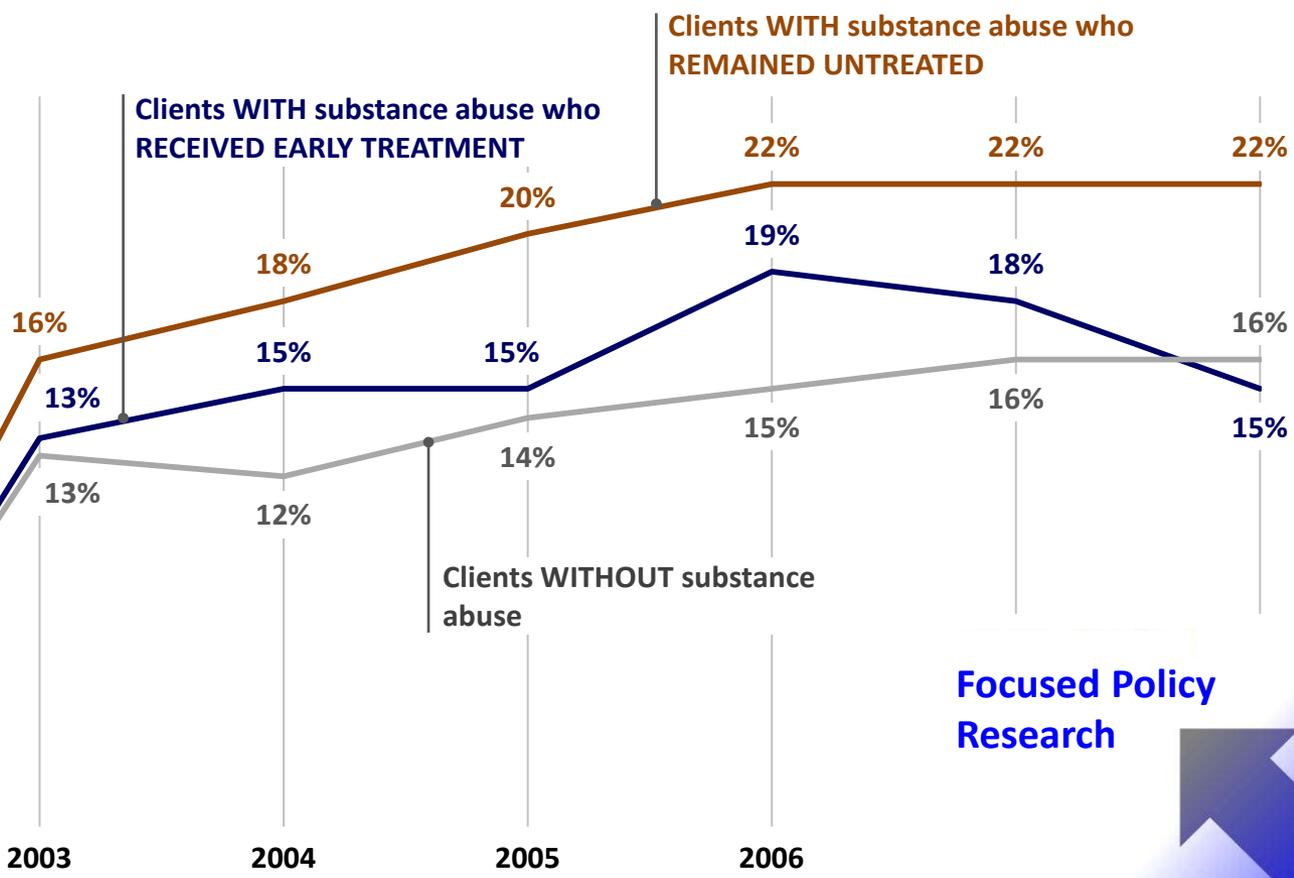


# Medical risk – implications of substance abuse

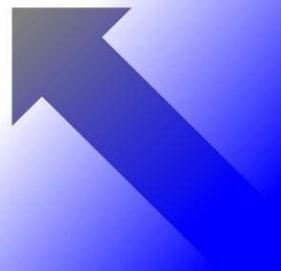
## Cardiovascular Disease Onset | Untreated substance abuse is a key driver

### Percent progressing from hypertension to major cardiovascular disease

Among Medicaid Disabled clients with hypertension but without more serious cardiovascular diagnosis in SFY 2002



Focused Policy Research



SOURCE: DSHS Research and Data Analysis Division, *The Health Impact of Substance Abuse: Accelerating Disease Progression and Death* Mancuso, Ford Shah, Huber, Felver, November 2011, <http://publications.rda.dshs.wa.gov/1448/>

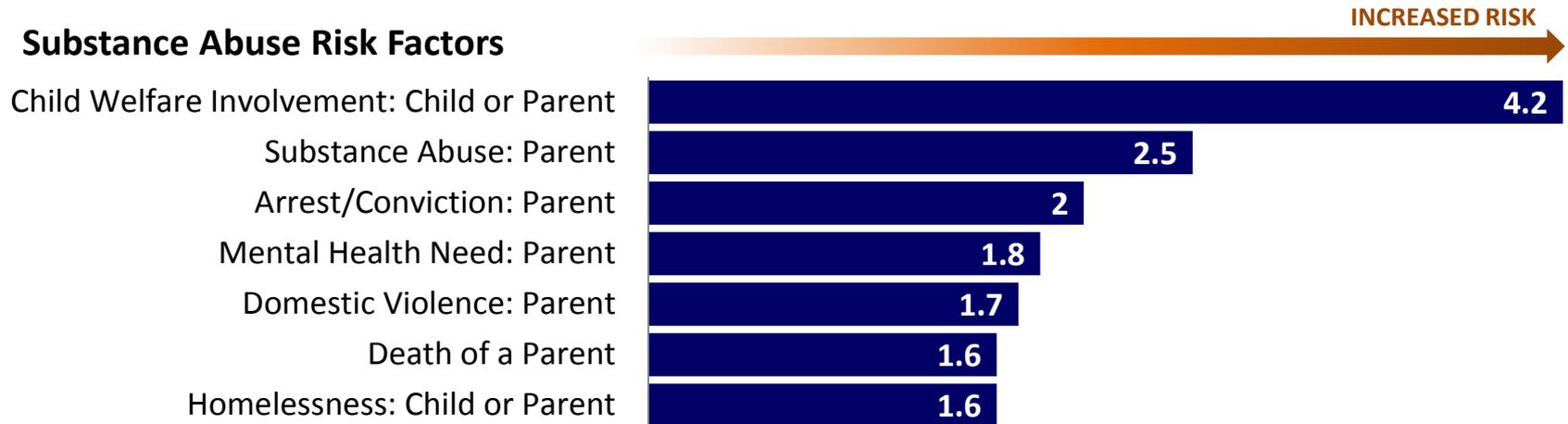


# Behavioral health risk – associations and patterns

## Risk Factors Associated with Behavioral Health

ODDS RATIOS, Youth age 12 to 17 enrolled in Medicaid in SFY 2008

### Substance Abuse Risk Factors



### Mental Health Risk Factors



SOURCE: DSHS Research and Data Analysis Division, *Paper in Progress*.



# TANF adults and behavioral health needs

## Behavioral Health Risks Among TANF Adults

Identified using pooled SFY 2005 to SFY 2009 indicators

**Neither MH nor AOD  
Treatment Need**

*n* = 26,319

**36%**

**MH Treatment  
Need Only**

*n* = 25,049

**34%**

**AOD Treatment  
Need Only**

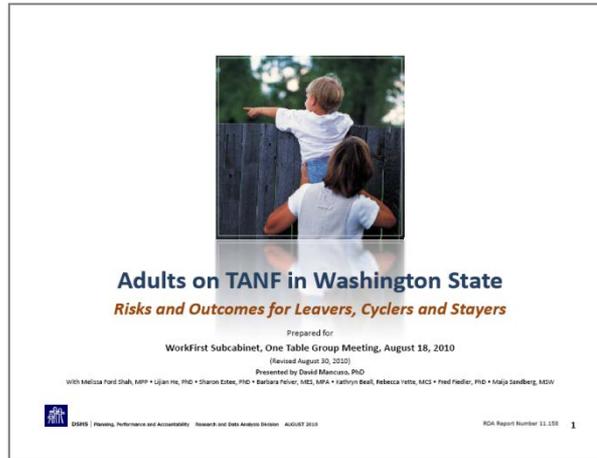
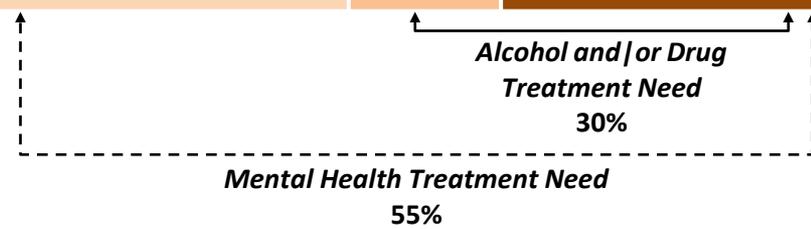
*n* = 6,916

**9%**

**Both MH and AOD  
Treatment Need**

*n* = 15,637

**21%**



**Focused Policy  
Research**



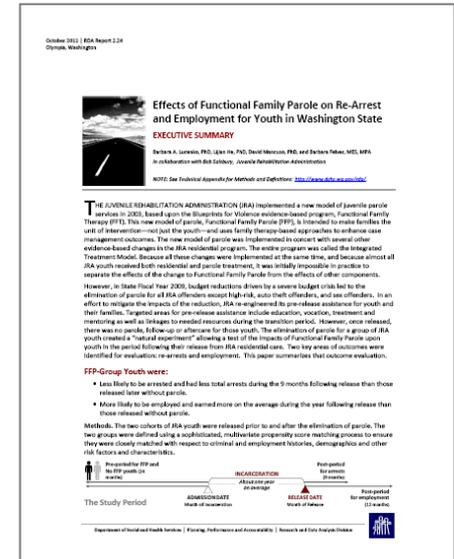
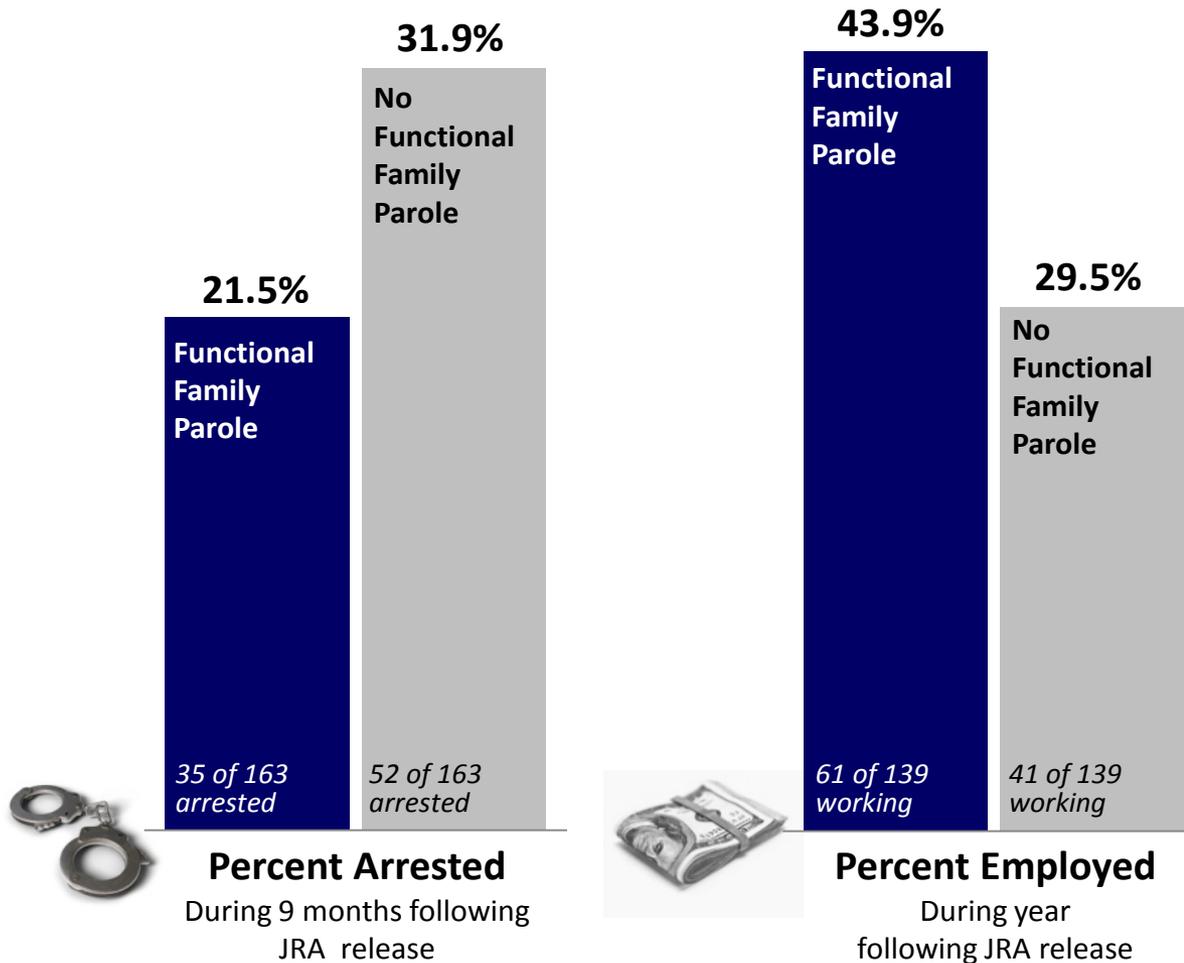
SOURCE: DSHS Research and Data Analysis Division, *Adults on TANF in Washington State, Risks and Outcomes for Leavers, Cyclers and Stayers*, Mancuso, Ford Shah, He, Estee, Felver, Beall, Yette, Fiedler, Sandberg, August 2010, <http://www.dshs.wa.gov/pdf/ms/rda/research/11/158.pdf>



# Outcomes of youth at risk

## Criminal justice and employment outcomes among youth

Comparing youth who received Functional Family Parole to those who did not



Focused Policy Research

SOURCE: DSHS Research and Data Analysis Division, *Effects of Functional Family Parole on Re-Arrest and Employment for Youth in Washington State*, Lucenko, He, Mancuso, Felver, October 2011, <http://www.dshs.wa.gov/pdf/ms/rda/research/2/24.pdf>



# Dynamic, current data for program managers

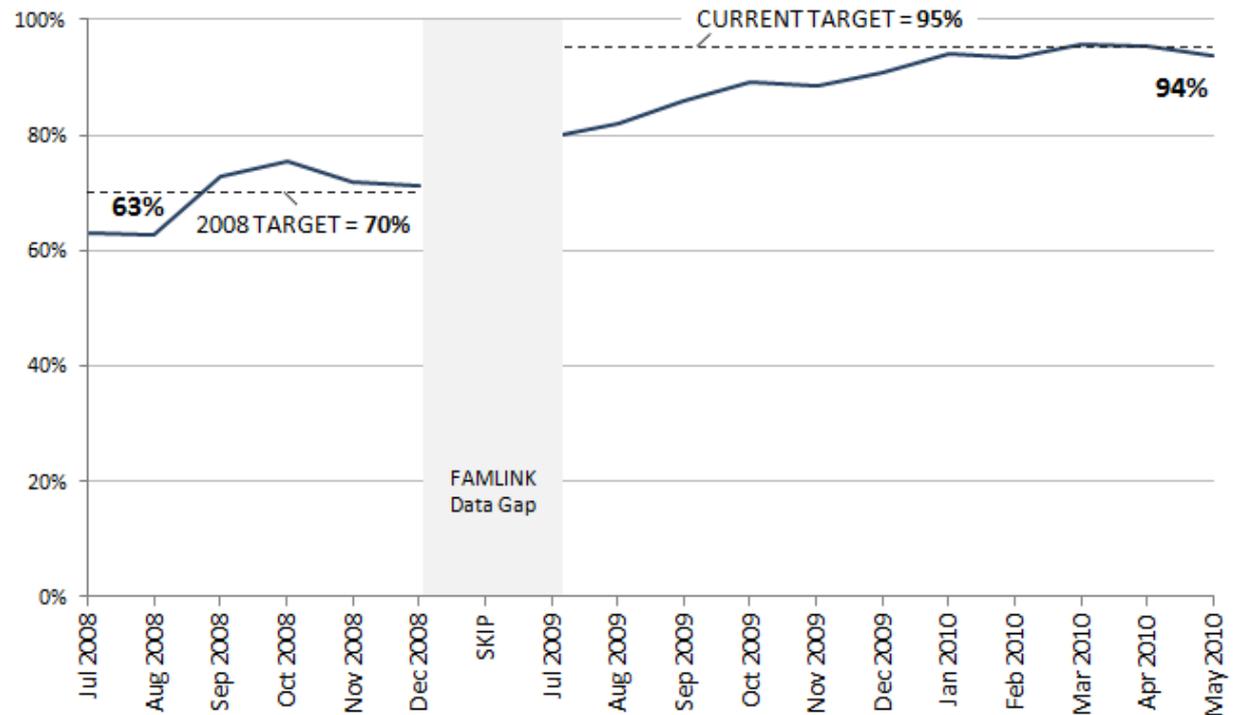
— Use rates, costs, trends, distance from targets —

## Operational Measures



## Q. Are social workers evaluating children's health and safety each month?

Rate of Children/Youth Visited by Social Workers During the Calendar Month  
Statewide Average



<http://www.dshs.wa.gov/ppa/coremetrics.shtml>

Management  
Decisions

# Allows us to reach clients during natural disasters

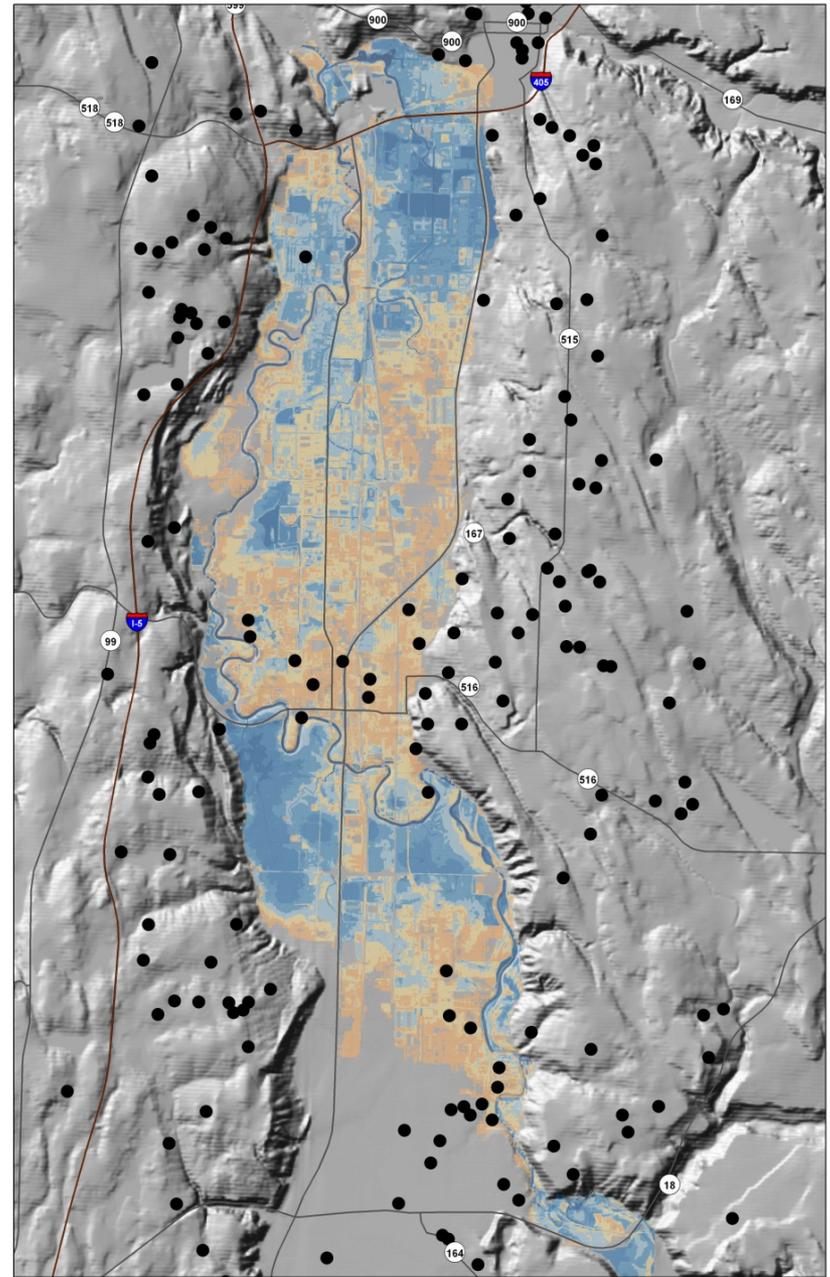
Clients who are vulnerable during fires, floods, earthquakes, tsunamis, other natural disasters

- Elderly
- Medically at risk
- Living with disabilities
- Persons with limited mobility

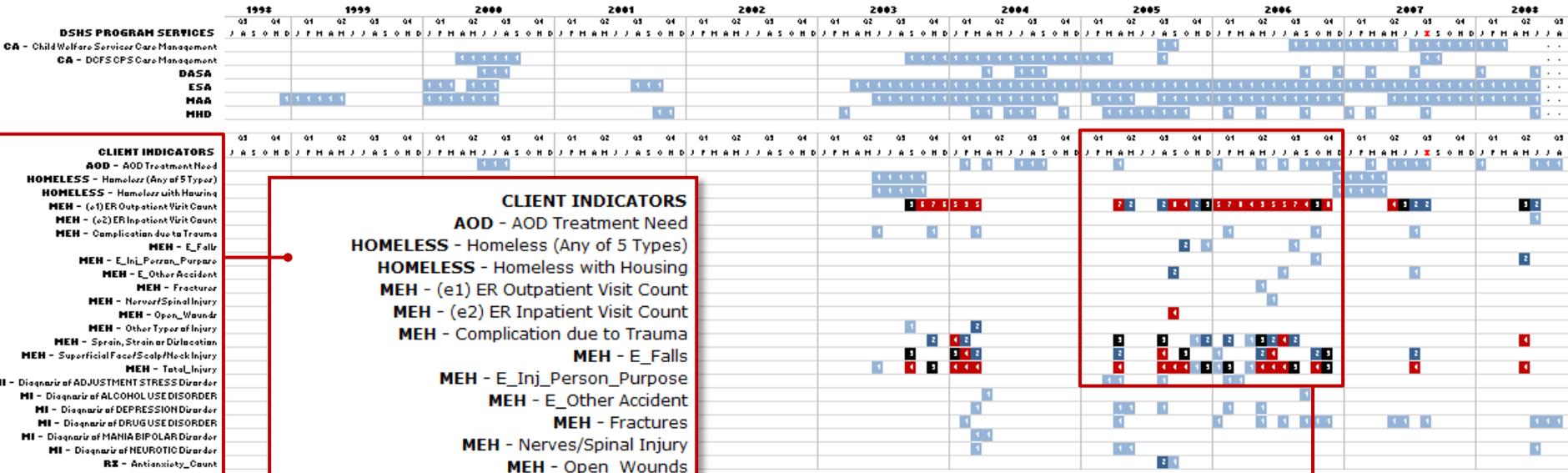
## Depth of Potential Flooding



Management  
Decisions



# Provides granular detail for clients at extreme risk



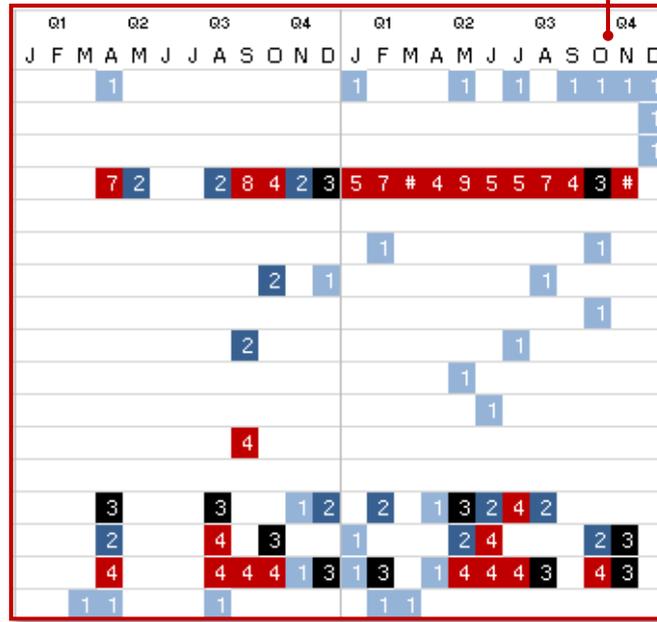
- CLIENT INDICATORS**
- AOD - AOD Treatment Need
  - HOMELESS - Homeless (Any of 5 Types)
  - HOMELESS - Homeless with Housing
  - MEH - (e1) ER Outpatient Visit Count
  - MEH - (e2) ER Inpatient Visit Count
  - MEH - Complication due to Trauma
  - MEH - E\_Falls
  - MEH - E\_Inj\_Person\_Purpose
  - MEH - E\_Other Accident
  - MEH - Fractures
  - MEH - Nerve/Spinal Injury
  - MEH - Open\_Wounds
  - MEH - Other Types of Injury
  - MEH - Sprain, Strain or Dislocation
  - MEH - Superficial Face/Scalp/Neck Injury
  - MEH - Total\_Injury
  - MI - Diagnosis of ADJUSTMENT STRESS Disorder
  - MI - Diagnosis of ALCOHOL USE DISORDER
  - MI - Diagnosis of DEPRESSION Disorder
  - MI - Diagnosis of DRUG USE DISORDER
  - MI - Diagnosis of MANIA BIPOLAR Disorder
  - MI - Diagnosis of NEUROTIC Disorder
  - RX - Antianxiety\_Count

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  - MI - Diagnosis of NEUROTIC Disorder
  - RX - Antianxiety\_Count
  - RX - Anticonvulsants\_Count
  - RX - Antidepressants\_Count
  - RX - Antipsychotic\_Count
  - RX - Sedatives\_Count

## Indicators

- Homelessness
- Arrests, Convictions
- Medical Encounters
- Diagnoses
- Injuries
- Prescription Meds

## Management Decisions



Number of instances per month Since 1998

NOTE: This level of detail is protected by law and is used for internal uses only

# "Off-the-shelf" data for policy makers



## DSHS Client Services July 2007 - June 2008

Legislative District 1	All Ages			
	Clients		Dollars	
	Number Served	Use Rate	Total Spent	Per Client
Population	142,230			
<b>Ageing and Adult Services Total</b>	<b>876</b>	<b>0.6%</b>	<b>\$14,211,689</b>	<b>\$17,205</b>
Adult Family Homes	216	0.2%	\$2,630,435	\$12,235
Adult Residential Care	2	0.0%	\$4,771	\$2,386
Assisted Living	33	0.0%	\$268,437	\$8,074
Comprehensive Assessments	610	0.4%	\$950,546	\$1,558
In-Home Services	364	0.3%	\$4,950,181	\$13,599
Managed Care	14	0.0%	\$3,166	\$226
Nursing Facilities	192	0.1%	\$4,788,512	\$24,930
Additional Services	187	0.1%	\$819,640	\$3,314
<b>Children's Services Total</b>	<b>7,650</b>	<b>7.0%</b>	<b>\$4,886,197</b>	<b>\$1,771</b>
Adoption and Adoption Support	538	0.4%	\$1,103,529	\$2,051
Behavioral Rehabilitation Services	11	0.0%	\$523,471	\$47,588
Child Care Services	136	0.1%	\$468,527	\$3,446
Child Protective Services (CPS) Case Management	1,867	1.2%	\$375,121	\$225
Child and Family Welfare Services Case Management	440	0.3%	\$919,082	\$2,089
Family Reconciliation Services (FRS)	403	0.3%	\$107,339	\$266
Family Voluntary Services Case Management	301	0.2%	\$126,896	\$422
Family-Focused Services	161	0.1%	\$237,383	\$1,472
Foster Care Placement Services	99	0.1%	\$534,891	\$5,403
Foster Care Support Services	205	0.1%	\$287,295	\$1,401
Other Intensive Services	10	0.0%	\$198,035	\$19,804
Additional Services	2	0.0%	\$8,818	\$3,309
<b>Developmental Disabilities Total</b>	<b>764</b>	<b>0.5%</b>	<b>\$10,894,976</b>	<b>\$14,260</b>
Case Management	755	0.5%	\$762,241	\$1,010
Community Residential Services	86	0.1%	\$4,956,200	\$57,630
County Services	291	0.2%	\$958,937	\$3,288
Family Support Services	113	0.1%	\$343,320	\$3,038
Personal Care Services	207	0.1%	\$3,147,209	\$15,204
Professional Support Services	84	0.1%	\$15,796	\$188
RHCs and Nursing Facilities	2	0.0%	\$233,340	\$118,670
Voluntary Placement-Children	9	0.0%	\$479,983	\$53,329
<b>Economic Services Total</b>	<b>16,906</b>	<b>11.9%</b>	<b>\$13,180,207</b>	<b>\$780</b>
Basic Food Program	6,883	4.8%	\$5,307,983	\$771
Child Support Services	12,027	8.5%	\$1,507,002	\$125
Consolidated Emergency Assistance Program	1	0.0%	\$123	\$123
Diversion Cash Assistance	93	0.1%	\$42,204	\$454
General Assistance	684	0.5%	\$1,400,557	\$2,048
Refugee Assistance	20	0.0%		
Refugee and Immigrant Services	61	0.0%		
Supplemental Security Income-State	477	0.3%		
TANF and State Family Assistance	1,325	0.9%		
Working Connections Child Care	1,580	1.1%		
Additional Services	435	0.3%		
<b>Juvenile Rehabilitation Total</b>	<b>46</b>	<b>0.0%</b>		
Dispositional Alternatives	33	0.0%		
Functional Family Practice	8	0.0%		
Institutions, Youth Camps, and Basic Training	11	0.0%		
<b>Medical Assistance Total</b>	<b>15,557</b>	<b>10.9%</b>		

Research & Data Analysis Division

Parameters Selected: State Fiscal Year 2008, Legislative District, Legislative District 1, All

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<http://clientdata.rda.dshs.wa.gov/>

Public and  
Legislative Access

## Legislative District Detail

- Prepared tables
- Client counts
- Costs by district
- Use rates
- Specific services used



Washington State Client  
Counts and Direct Service  
Costs by Legislative District

January 2011



# County level service detail and costs



DSHS Client Services by Race  
July 2009 - June 2010

King County	DSHS Clients Served	White Non-Minority	Minority Groups				
			Any Minority	African American	Amer Indian / Alaska Nat	Asian / Pac Islander	Hispanic
<b>Aging and Adult Services Total</b>	<b>19,491</b>	<b>56.8%</b>	<b>42.5%</b>	<b>15.1%</b>	<b>2.9%</b>	<b>23.0%</b>	<b>3.9%</b>
Adult Family Homes	2,120	74.7%	25.3%	9.3%	3.4%	12.0%	2.8%
Adult Residential Care	253	73.9%	26.1%	15.4%	2.8%	5.5%	4.0%
Assisted Living	1,231	76.9%	22.9%	8.8%	2.3%	10.6%	3.0%
Comprehensive Assessments	12,630	52.2%	47.5%	16.0%	2.9%	27.3%	4.0%
In-Home Services	10,349	44.0%	55.9%	17.8%	2.9%	33.8%	4.4%
Managed Care	98	44.0%	55.1%	24.5%	6.1%	26.5%	6.1%
Nursing Facilities	5,699	69.4%	28.9%	11.6%	3.0%	12.3%	3.5%
Additional Services	2,348	69.7%	30.3%	10.1%	3.8%	15.2%	3.6%
<b>Alcohol and Substance Abuse Total</b>	<b>18,806</b>	<b>47.7%</b>	<b>61.6%</b>	<b>26.2%</b>	<b>12.7%</b>	<b>9.5%</b>	<b>11.7%</b>
ADATSA Assessments	2,274	50.5%	49.3%	27.5%	12.2%	7.1%	8.8%
Assessments-General	7,538	41.6%	68.0%	28.0%	14.5%	10.1%	14.2%
Detoxification	2,319	53.8%	45.8%	26.5%	13.4%	5.8%	7.6%
Opiate Substitution Treatment	2,745	66.6%	33.3%	15.7%	10.9%	5.8%	6.0%
Outpatient Treatment	11,700	47.5%	52.2%	25.3%	13.0%	9.8%	11.4%
Residential Treatment	2,623	48.4%	61.4%	27.0%	17.3%	6.8%	8.9%
Additional Services	1,714	57.9%	40.7%	18.1%	11.9%	9.1%	7.7%
<b>Children's Services Total</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
Adoption and Adoption Support Payments	-	-	-	-	-	-	-
Behavioral Rehabilitation Services	375	23.7%	76.0%	47.5%	25.3%	8.0%	13.3%
Case Management	-	-	-	-	-	-	-
Child Care Services	1,165	28.9%	70.6%	44.1%	18.0%	7.9%	19.2%
Family Reconciliation Services (FRS)	-	-	-	-	-	-	-
Payments	-	-	-	-	-	-	-
Family-Focused Services	1,590	27.9%	71.2%	39.5%	19.3%	10.1%	19.3%
Foster Care Placement Services	1,491	29.1%	70.7%	40.2%	20.9%	10.5%	16.3%
Foster Care Support Services	1,585	29.7%	70.2%	42.4%	19.6%	8.5%	16.3%
Other Intensive Services	101	35.6%	64.4%	34.7%	17.8%	9.9%	16.8%
Additional Services	22	13.6%	86.4%	36.4%	50.0%	9.1%	31.8%
<b>Developmental Disabilities Total</b>	<b>11,661</b>	<b>56.7%</b>	<b>39.3%</b>	<b>12.6%</b>	<b>3.5%</b>	<b>14.4%</b>	<b>12.3%</b>
Employment and Day Programs	4,307	57.0%	35.4%	9.4%	3.0%	11.9%	13.4%
Field Services	11,588	56.8%	39.2%	12.4%	3.5%	14.4%	12.3%
Individual and Family Services	463	64.2%	35.9%	11.0%	2.8%	19.0%	6.1%
Other Community Services	1,107	66.6%	33.4%	13.6%	3.3%	14.5%	4.6%
Personal Care Services	3,096	62.9%	37.1%	16.1%	4.3%	14.8%	5.3%
Professional Services	1,398	73.1%	28.8%	10.3%	3.4%	10.5%	4.5%
RHCs and Nursing Facilities	248	87.1%	12.9%	3.6%	2.8%	3.6%	3.2%
Residential Programs	1,257	80.0%	19.9%	9.0%	4.2%	5.7%	2.3%
State Operated Living Alternatives	49	85.7%	14.3%	8.2%	2.0%	2.0%	2.0%
<b>Economic Services Total</b>	<b>366,257</b>	<b>36.0%</b>	<b>46.9%</b>	<b>21.4%</b>	<b>4.0%</b>	<b>12.7%</b>	<b>12.6%</b>
Basic Food Program	255,168	36.0%	51.0%	23.4%	4.3%	14.5%	13.0%
Child Support Services	184,200	36.7%	46.4%	24.9%	4.8%	8.6%	12.5%
Consolidated Emergency Assistances Program	86	26.5%	61.9%	32.4%	2.9%	-	33.8%
Disability Lifetime / General Assistance	19,375	44.7%	50.5%	27.0%	7.7%	14.4%	7.5%
Diversion Cash Assistance	3,351	31.1%	66.0%	34.7%	4.3%	12.2%	11.0%
Refugee Assistance	1,115	12.4%	41.4%	21.8%	-	15.1%	6.7%
Refugee and Immigrant Services	5,390	19.2%	54.6%	33.0%	0.1%	17.9%	6.9%
Supplemental Security Income-State	14,237	33.3%	61.3%	9.7%	1.6%	47.4%	4.4%
TANF and State Family Assistance	55,725	23.9%	62.1%	34.1%	5.9%	11.0%	11.0%

Research & Data Analysis Division

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Public and  
Legislative Access

## County Tables

- Service use rates
- Direct service costs
- By age
- Race/ethnicity
- 10 years of data

<http://clientdata.rda.dshs.wa.gov/>



# Trends in service use and risk factors by county

ADULT  
BEHAVIOR



[TO CONTENTS](#)

NOVEMBER 2011

## 4c. Risk Factors for DSHS Adults with Behavioral Health Needs

State Fiscal Year 2008

This table reports on "risks" seen in DSHS data for adults (18 and up) served in SFY 2008 (July 1, 2007 to June 30, 2008), who have recently experienced mental illness or alcohol/drug problems. Recent mental illness is defined as one or more of the following events between July 1, 2006 and June 30, 2008: a diagnosis of psychotic, bipolar, depression, anxiety, adjustment, ADHD, conduct or impulse disorder; receipt of antipsychotic, bipolar, antidepressant, antianxiety, or ADHD medications; receipt of mental health services through DSHS Division of Behavioral Health and Recovery, medical providers, tribal mental health, or Behavioral Rehabilitation Services provided through the DSHS Children's Administration. A recent alcohol/drug problem is defined as one or more of the following events occurring between July 1, 2006 and June 30, 2008: a diagnosis of alcohol or drug abuse, dependence, or psychosis; alcohol/drug treatment services received through the DSHS Division of Behavioral Health and Recovery, or arrests for alcohol/drug related offenses.

Public and  
Legislative Access

WASHINGTON STATE

DSHS Adults with Behavioral Health Needs						
Risks	Any Mental Illness			Alcohol/Drug Problem		
	PERCENT	NUMBER	DENOMINATOR	PERCENT	NUMBER	DENOMINATOR
Treated for Injuries <sup>1</sup>	35%	57,227	161,527	39%	27,705	71,091
Mental Health Need <sup>1</sup>	100%	161,527	161,527	66%	47,031	71,091
Alcohol or Drug Need <sup>1</sup>	29%	47,031	161,527	100%	71,091	71,091
Homeless in Past Year <sup>2</sup>	17%	23,972	143,480	33%	27,964	83,775
Employed <sup>3</sup>	33%	64,096	194,538	47%	57,136	121,459
Arrested <sup>3</sup>	13%	24,879	194,538	40%	47,983	121,459
Convicted <sup>3</sup>	12%	23,670	194,538	33%	40,519	121,459



<sup>1</sup> Denominator is all persons with at least one month of DSHS medical coverage in SFY 2008. <sup>2</sup> Denominator is all persons with at least one month of receipt of food assistance or a TANF or General Assistance cash grant in SFY 2008. <sup>3</sup> Denominator is all clients in the population.

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## Prepared Reports

- Risk factors for infants, parents, youth, adults, elderly
- Treatment for injuries
- Alcohol/drug treatment need
- Mental health treatment need
- Employment
- Arrests, convictions
- Service history
- Adverse childhood experiences
- Homelessness
- Disabilities
- Demographics



# Client Registry supports coordinated service delivery

—Desktop tool for Case Managers for cross-program coordination —



Direct Care Management

- Connects directly to most DSHS client information systems
- Reduces workload redundancies, decreases costs, improves client outcomes
- Confidential, secure, updated nightly
- Shows when and where clients received services and who to contact to coordinate services

## Client Registry

The screenshot shows the DSHS Client Registry interface. At the top, there's a navigation bar with 'Name Search', 'SSN Search', 'Client ID Search', and 'Useful Links'. Below this, a search results page for 'Doe, John E.' is displayed. The page includes a table of program assignments and a 'SERVICE HISTORY OF SELECTED CLIENT' table. A 'CASE WORKER' section is also visible at the bottom.

Program Name	Client Name	DOB	Sex	SSN	Updated	Client Id	Tribal	Language
ADATSA (DASA)	Doe, John E.	01011978	M	000-00-0000	10/21/1998	Example#	Makah	
BASIC FOOD	Doe, John E.	01011978	M	000-00-0000	06/04/2012	Example#	Makah	ENGLISH
ECONOMIC SVCS GRANTS	Doe, John E.	01011978	M	000-00-0000	06/04/2012	Example#	Makah	ENGLISH

Program Name	Begin	End	Site Name	Site County	Site Phone
ECONOMIC SVCS GRANTS	07/2010	06/2012	OLYMPIA	THURSTON	360-753-5983
ECONOMIC SVCS GRANTS	06/2009	07/2009	OLYMPIA	THURSTON	360-753-5983
ECONOMIC SVCS GRANTS	08/1998	08/1998	OLYMPIA CSO	THURSTON	877-980-9180

Program Name	Case Worker	Phone	Service Begin	Service Thru	Site Name	Email
GRANTS	SHIRLY SPADE	(360) 725-0000	02/2005	OPEN	SPARC Intensive Inpatient	



# Cutting edge predictive risk application

— Hands-on tool for front line workers —



**Direct Care Management**

## Predictive Risk Intelligence System (P·R·I·S·M)

Home **Clinical Profile** Search Reports

Members Eligibility Episodes Claims Office IP Rx **ER** AOD MH LTC Labs Providers CARE PAM HRI

DEMOGRAPHICS: (+/-)

Name:  firstname lastname Date of birth:

Gender:  Age: 58

Client ID:  Phone:

RISK PROFILE FOR SERVICE DATE RANGE FROM 2009-07-05 TO 2010-09-18

Risk Score: **3.03** Expected Annual Cost: **\$30,906**

Primary Risk: **Cardiovascular, medium** Secondary Risk: **Pulmonary, medium**

Mental Illness: **Psychotic Illness / Bipolar - Rx** Substance Abuse: **Yes**

Outpatient ER

[View as PDF](#)

Service Start Date	Primary Diagnosis	Paid	NE	EPCT	EPCP	ENP	Alcohol	Drug	Injury	Psych	Other	Provider	E Codes
2010-08-28	OTHER CONVULSIONS	\$528.65		25%	75%							de-identified	FALL NEC
2010-06-24	EDEMA	\$182.21									yes	de-identified	
2010-06-19	CELLULITIS OF LEG	\$300.71									yes	de-identified	
2010-04-17	ANXIETY STATE NOS	\$142.01								yes		de-identified	ACCIDENT NOS
2010-03-19	ANXIETY STATE NOS	\$107.56								yes		de-identified	
2010-01-02	DIABETES W/O COMPLICATION	\$228.04	60%	6%	34%							de-identified	
2009-12-18	EPILEPSY, UNSPECIFIED	\$259.74									yes	de-identified	
2009-11-28	ANXIETY STATE NOS	\$107.24								yes		de-identified	
2009-10-26	PAINFUL RESPIRATION	\$435.91		82%		18%						de-identified	
2009-10-17	ANXIETY STATE NOS	\$396.85								yes		de-identified	
2009-10-15	SWELLING OF LIMB	\$107.24	60%	20%		20%						de-identified	
2009-09-28	HEADACHE	\$578.98	78%	9%		13%						de-identified	

- Decision support tool to support care management interventions for high-risk Medicaid patients
- Intuitive and accessible health and demographic information from administrative data sources
- Continues to evolve to meet changing program needs
- Over 400 users



# How did we get here?

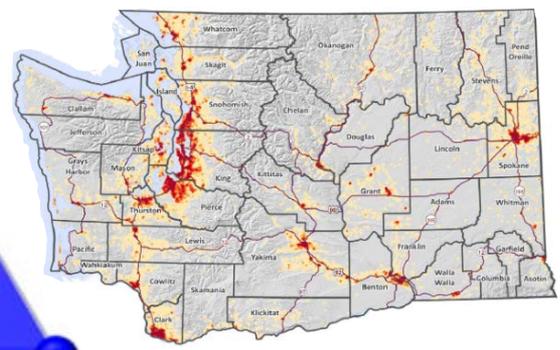
— *A sustaining vision and long-term commitment* —

- ▶ Very early, we knew we needed to match **client information from 16 systems** with **direct service dollars** and **geographical information** to respond to policy questions about our services

**Clients**



**Service Dollars**



**Geography**

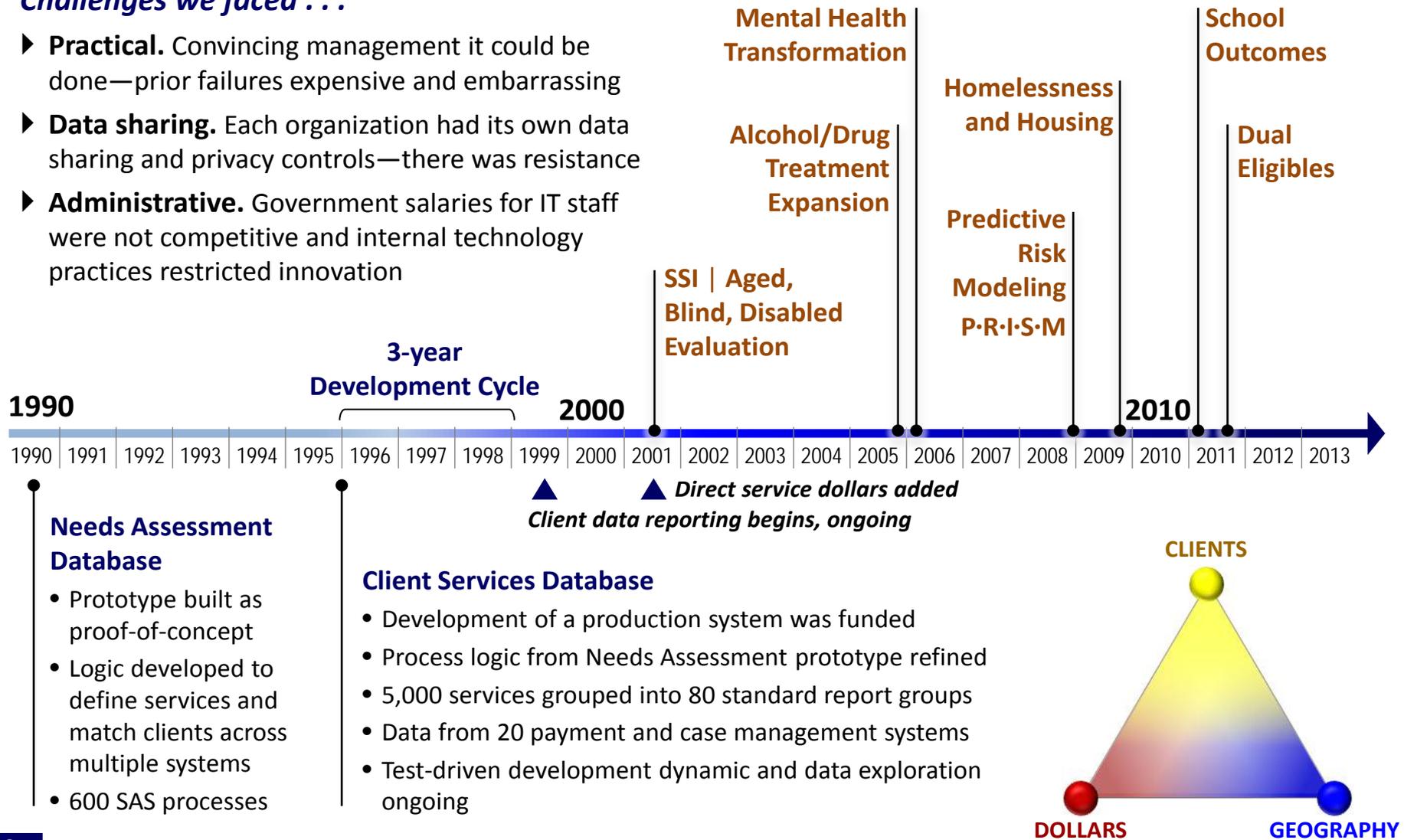


# How did we get here?

— Leveraging investments over time —

## Challenges we faced . . .

- ▶ **Practical.** Convincing management it could be done—prior failures expensive and embarrassing
- ▶ **Data sharing.** Each organization had its own data sharing and privacy controls—there was resistance
- ▶ **Administrative.** Government salaries for IT staff were not competitive and internal technology practices restricted innovation



# Sustainability

## — *Lessons learned from our 20 year track record* —

### *Funding is—and will always be—a challenge*

#### ▶ **Our best marketing tool is our analytical capability**

- Many vendors can organize data into databases with Business Intelligence tools that push the hard analytical work back on the end user
- Our competitive advantage is that we have the analytical capability to extract meaning from complex data
- With recent budget shortfalls, we've become more entrepreneurial in developing internal funding while also developing more federal grant and private foundation funding

### *Health and social service programs and technologies are always evolving*

#### ▶ **We are always learning, always improving**

- Maintaining an understanding of changing programs and source IT systems is main threat to sustainability
- Need to stay on top of technologies to manage “Big Data”

### *Attracting and retaining talented staff is critical*

#### ▶ **Our key investment is in our staff**

- Where we are sometimes unable to offer competitive salaries, we can offer flexibility and the opportunity to make a real difference in peoples' lives
- Our team translates data into real-life, practical analyses that directly inform policy





<http://www.dshs.wa.gov/rda/>

