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

Focused Policy Research
Management Decisions
Public and Legislative Access
Direct Care Management
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.
Focused policy research informs state and national policy
— Hundreds of formal, in-depth studies —

http://www.dshs.wa.gov/rda/
The Health Impact of Substance Abuse: Accelerating Disease Progression and Death
## 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
- Child Welfare Involvement: Child or Parent
- Substance Abuse: Parent
- Arrest/Conviction: Parent
- Mental Health Need: Parent
- Domestic Violence: Parent
- Death of a Parent
- Homelessness: Child or Parent

#### Mental Health Risk Factors
- Child Welfare Involvement: Child or Parent
- Mental Health Need: Parent
- Substance Abuse: Parent
- Death of a Parent
- Domestic Violence: Parent
- Arrest/Conviction: Parent
- Homelessness: Child or Parent

---

**SUBSTANCE ABUSE RISK FACTORS**

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child Welfare Involvement: Child</td>
<td>4.2</td>
</tr>
<tr>
<td>Parent or Parent</td>
<td></td>
</tr>
<tr>
<td>Substance Abuse: Parent</td>
<td>2.5</td>
</tr>
<tr>
<td>Arrest/Conviction: Parent</td>
<td>2.0</td>
</tr>
<tr>
<td>Mental Health Need: Parent</td>
<td>1.8</td>
</tr>
<tr>
<td>Domestic Violence: Parent</td>
<td>1.7</td>
</tr>
<tr>
<td>Death of a Parent</td>
<td>1.6</td>
</tr>
<tr>
<td>Homelessness: Child or Parent</td>
<td>1.6</td>
</tr>
</tbody>
</table>

**MENTAL HEALTH RISK FACTORS**

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child Welfare Involvement: Child</td>
<td>3.4</td>
</tr>
<tr>
<td>Parent or Parent</td>
<td></td>
</tr>
<tr>
<td>Mental Health Need: Parent</td>
<td>2.5</td>
</tr>
<tr>
<td>Substance Abuse: Parent</td>
<td>1.8</td>
</tr>
<tr>
<td>Death of a Parent</td>
<td>1.6</td>
</tr>
<tr>
<td>Domestic Violence: Parent</td>
<td>1.5</td>
</tr>
<tr>
<td>Arrest/Conviction: Parent</td>
<td>1.5</td>
</tr>
<tr>
<td>Homelessness: Child or Parent</td>
<td>1.1</td>
</tr>
</tbody>
</table>

**INCREASED RISK**

**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

<table>
<thead>
<tr>
<th>Category</th>
<th>n</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neither MH nor AOD Treatment Need</td>
<td>26,319</td>
<td>36%</td>
</tr>
<tr>
<td>MH Treatment Need Only</td>
<td>25,049</td>
<td>34%</td>
</tr>
<tr>
<td>AOD Treatment Need Only</td>
<td>6,916</td>
<td>9%</td>
</tr>
<tr>
<td>Both MH and AOD Treatment Need</td>
<td>15,637</td>
<td>21%</td>
</tr>
</tbody>
</table>

Outcomes of youth at risk

Criminal justice and employment outcomes among youth
Comparing youth who received Functional Family Parole to those who did not

<table>
<thead>
<tr>
<th>Percent Arrested</th>
<th>Functional Family Parole</th>
<th>No Functional Family Parole</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>31.9%</td>
<td>43.9%</td>
</tr>
<tr>
<td>35 of 163 arrested</td>
<td>61 of 139 working</td>
<td>52 of 163 arrested</td>
</tr>
</tbody>
</table>

Percent Arrested During 9 months following JRA release

Percent Employed During year following JRA release

Dynamic, current data for program managers
— Use rates, costs, trends, distance from targets —

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

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

**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

http://clientdata.rda.dshs.wa.gov/
### County level service detail and costs

**DSHS Client Services by Race**
**July 2009 - June 2010**

<table>
<thead>
<tr>
<th>King County</th>
<th>DSHS Clients Served</th>
<th>White Non- Minority</th>
<th>Any Minority</th>
<th>African American</th>
<th>Amer Indian / Alaska Native</th>
<th>Asian / Pacific Islander</th>
<th>Hispanic</th>
</tr>
</thead>
<tbody>
<tr>
<td>King County</td>
<td>20,193</td>
<td>66.3%</td>
<td>24.5%</td>
<td>15.4%</td>
<td>2.6%</td>
<td>23.9%</td>
<td>3.9%</td>
</tr>
<tr>
<td>Adult Family Homes</td>
<td>2,122</td>
<td>74.7%</td>
<td>24.5%</td>
<td>9.3%</td>
<td>3.1%</td>
<td>12.0%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Adult Residential Care</td>
<td>1,319</td>
<td>73.0%</td>
<td>35.1%</td>
<td>16.4%</td>
<td>3.4%</td>
<td>5.1%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Assisted Living</td>
<td>1,521</td>
<td>75.6%</td>
<td>34.6%</td>
<td>15.4%</td>
<td>3.3%</td>
<td>10.5%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Comprehensive Assessments</td>
<td>12,530</td>
<td>87.2%</td>
<td>47.5%</td>
<td>16.0%</td>
<td>2.9%</td>
<td>21.7%</td>
<td>4.0%</td>
</tr>
<tr>
<td>In-Home Services</td>
<td>940</td>
<td>44.0%</td>
<td>65.9%</td>
<td>11.8%</td>
<td>2.0%</td>
<td>33.6%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Managed Care</td>
<td>940</td>
<td>44.0%</td>
<td>65.9%</td>
<td>11.8%</td>
<td>2.0%</td>
<td>33.6%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Nursing Facilities</td>
<td>940</td>
<td>44.0%</td>
<td>65.9%</td>
<td>11.8%</td>
<td>2.0%</td>
<td>33.6%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Additional Services</td>
<td>2,435</td>
<td>69.7%</td>
<td>30.3%</td>
<td>10.1%</td>
<td>3.6%</td>
<td>15.2%</td>
<td>3.5%</td>
</tr>
<tr>
<td>Alcohol and Substance Abuse</td>
<td>1,572</td>
<td>69.6%</td>
<td>34.2%</td>
<td>21.9%</td>
<td>14.2%</td>
<td>35.6%</td>
<td>16.8%</td>
</tr>
<tr>
<td>ADATSA Assessments</td>
<td>2,274</td>
<td>63.6%</td>
<td>46.5%</td>
<td>27.5%</td>
<td>12.2%</td>
<td>7.1%</td>
<td>8.2%</td>
</tr>
<tr>
<td>Case Management</td>
<td>7,518</td>
<td>41.6%</td>
<td>56.0%</td>
<td>28.0%</td>
<td>18.5%</td>
<td>10.4%</td>
<td>14.2%</td>
</tr>
<tr>
<td>Disenrollment</td>
<td>2,310</td>
<td>63.6%</td>
<td>46.5%</td>
<td>27.5%</td>
<td>12.2%</td>
<td>6.6%</td>
<td>7.0%</td>
</tr>
<tr>
<td>Residential Treatment</td>
<td>17,700</td>
<td>61.8%</td>
<td>62.3%</td>
<td>26.4%</td>
<td>13.0%</td>
<td>9.0%</td>
<td>11.4%</td>
</tr>
<tr>
<td>Residential Treatment</td>
<td>2,523</td>
<td>48.4%</td>
<td>81.4%</td>
<td>27.5%</td>
<td>17.3%</td>
<td>8.8%</td>
<td>8.2%</td>
</tr>
<tr>
<td>Additional Services</td>
<td>1,714</td>
<td>57.6%</td>
<td>42.7%</td>
<td>18.1%</td>
<td>11.6%</td>
<td>9.1%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Child Protection Service</td>
<td>121</td>
<td>29.9%</td>
<td>70.1%</td>
<td>16.0%</td>
<td>7.0%</td>
<td>19.2%</td>
<td></td>
</tr>
<tr>
<td>Adoption and Adoption Support</td>
<td>375</td>
<td>23.7%</td>
<td>78.0%</td>
<td>47.5%</td>
<td>25.3%</td>
<td>8.0%</td>
<td>13.3%</td>
</tr>
<tr>
<td>Case Management</td>
<td>1,165</td>
<td>28.0%</td>
<td>70.1%</td>
<td>44.1%</td>
<td>16.0%</td>
<td>7.0%</td>
<td>19.2%</td>
</tr>
<tr>
<td>Family Reconciliation Services (FRC)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Family Focus Services</td>
<td>1,560</td>
<td>27.5%</td>
<td>71.2%</td>
<td>36.5%</td>
<td>18.5%</td>
<td>10.1%</td>
<td>19.5%</td>
</tr>
<tr>
<td>Foster Care Placement Services</td>
<td>1,491</td>
<td>39.1%</td>
<td>76.7%</td>
<td>43.0%</td>
<td>20.0%</td>
<td>10.5%</td>
<td>16.3%</td>
</tr>
<tr>
<td>Foster Care Support Services</td>
<td>1,580</td>
<td>29.7%</td>
<td>70.2%</td>
<td>42.6%</td>
<td>19.5%</td>
<td>8.2%</td>
<td>16.2%</td>
</tr>
<tr>
<td>Other Intensive Services</td>
<td>101</td>
<td>38.4%</td>
<td>71.2%</td>
<td>36.5%</td>
<td>18.5%</td>
<td>9.1%</td>
<td>16.2%</td>
</tr>
<tr>
<td>Temporary Assistance</td>
<td>1,631</td>
<td>39.1%</td>
<td>76.7%</td>
<td>43.0%</td>
<td>20.0%</td>
<td>10.5%</td>
<td>16.3%</td>
</tr>
<tr>
<td>Employment and Day Programs</td>
<td>4,307</td>
<td>57.0%</td>
<td>56.4%</td>
<td>9.4%</td>
<td>3.0%</td>
<td>11.0%</td>
<td>13.4%</td>
</tr>
<tr>
<td>General Services</td>
<td>11,585</td>
<td>56.8%</td>
<td>39.2%</td>
<td>17.4%</td>
<td>3.6%</td>
<td>14.4%</td>
<td>12.5%</td>
</tr>
<tr>
<td>Individual and Family Services</td>
<td>405</td>
<td>62.4%</td>
<td>38.2%</td>
<td>17.0%</td>
<td>2.5%</td>
<td>19.0%</td>
<td>6.1%</td>
</tr>
<tr>
<td>Intensive Services</td>
<td>1,107</td>
<td>66.5%</td>
<td>34.3%</td>
<td>13.5%</td>
<td>3.3%</td>
<td>14.5%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Intensive Services</td>
<td>2,000</td>
<td>62.0%</td>
<td>31.1%</td>
<td>16.1%</td>
<td>4.2%</td>
<td>14.2%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Residential Treatment</td>
<td>1,390</td>
<td>73.1%</td>
<td>26.0%</td>
<td>10.2%</td>
<td>3.4%</td>
<td>10.5%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Residential Treatment</td>
<td>2,141</td>
<td>87.1%</td>
<td>12.9%</td>
<td>2.6%</td>
<td>2.8%</td>
<td>3.4%</td>
<td>3.5%</td>
</tr>
<tr>
<td>State Administered Link Program</td>
<td>1,257</td>
<td>82.0%</td>
<td>19.6%</td>
<td>9.0%</td>
<td>4.2%</td>
<td>57.7%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Temporary Assistance</td>
<td>5,414</td>
<td>16.3%</td>
<td>4.3%</td>
<td>2.0%</td>
<td>3.0%</td>
<td>12.0%</td>
<td>3.5%</td>
</tr>
</tbody>
</table>

**Public and Legislative Access**

- 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

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.

<table>
<thead>
<tr>
<th>Risks</th>
<th>DSHS Adults with Behavioral Health Needs</th>
<th>Alcohol/Drug Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent</td>
<td>Number</td>
</tr>
<tr>
<td>Treated for Injuries$^1$</td>
<td>30%</td>
<td>57,237</td>
</tr>
<tr>
<td>Mental Health Need$^2$</td>
<td>100%</td>
<td>161,527</td>
</tr>
<tr>
<td>Alcohol or Drug Need$^1$</td>
<td>29%</td>
<td>47,031</td>
</tr>
<tr>
<td>Homeless in Past Year$^1$</td>
<td>17%</td>
<td>23,872</td>
</tr>
<tr>
<td>Employed$^2$</td>
<td>33%</td>
<td>64,096</td>
</tr>
<tr>
<td>Arrested$^2$</td>
<td>13%</td>
<td>24,873</td>
</tr>
<tr>
<td>Convicted$^2$</td>
<td>12%</td>
<td>23,670</td>
</tr>
</tbody>
</table>

* Denominator is all persons with at least one month of case service coverage in SFY 2008. ** Denominator is persons with at least one month of receipt of case service or a state or federal substance use grant in SFY 2008. $ Denominator is all clients in the population.

http://publications.rda.dshs.wa.gov/1449/
Client Registry supports coordinated service delivery
—Desktop tool for Case Managers for cross-program coordination—

- 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
Cutting edge predictive risk application
— Hands-on tool for front line workers —

Direct Care Management

- 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

Predictive Risk Intelligence SysteM (P•R•I•S•M)

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
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.
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

---

**Needs Assessment Database**
- Prototype built as proof-of-concept
- Logic developed to define services and match clients across multiple systems
- 600 SAS processes

**Client Services Database**
- Development of a production system was funded
- Process logic from Needs Assessment prototype refined
- 5,000 services grouped into 80 standard report groups
- Data from 20 payment and case management systems
- Test-driven development dynamic and data exploration ongoing

---

**3-year Development Cycle**

- **1990**
- **1991**
- **1992**
- **1993**
- **1994**
- **1995**
- **1996**
- **1997**
- **1998**
- **1999**
- **2000**
- **2001**
- **2002**
- **2003**
- **2004**
- **2005**
- **2006**
- **2007**
- **2008**
- **2009**
- **2010**
- **2011**
- **2012**
- **2013**

**Direct service dollars added**

- **Client data reporting begins, ongoing**

---

**CLIENTS**

**DOLLARS**

**GEOGRAPHY**

- **1990-2000**
  - SSI | Aged, Blind, Disabled Evaluation
  - Mental Health Transformation
  - Alcohol/Drug Treatment Expansion
  - Homelessness and Housing
  - Predictive Risk Modeling P·R·I·S·M
  - School Outcomes
  - Dual Eligibles

- **2010**
  - 3-year Development Cycle
  - Direct service dollars added
  - Client data reporting begins, ongoing
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
Questions?

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