Leveraging Data Analytics in Audits and Investigations

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Oregon Audits Division

Mountain & Plains Intergovernmental Audit Forum

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Agenda

- Overview of Software
- Looking for Outliers/Benfords Law
- Data Matching in Audits
- Data Matching in Investigations

Why data matching is important

- Data matching provides valuable insights that can not be obtained from using the individual sources
  - The whole is greater than the sum of its parts - Aristotle
- Improves fraud detection

ACL (Audit Command Language)
What does it do?

- Allows auditors to extract and analyze data independent of programmers and auditees
- Summarizes large amounts of data
- 100% testing of large populations
- Increases probability of detecting errors and omissions
- Increases probability of detecting fraud
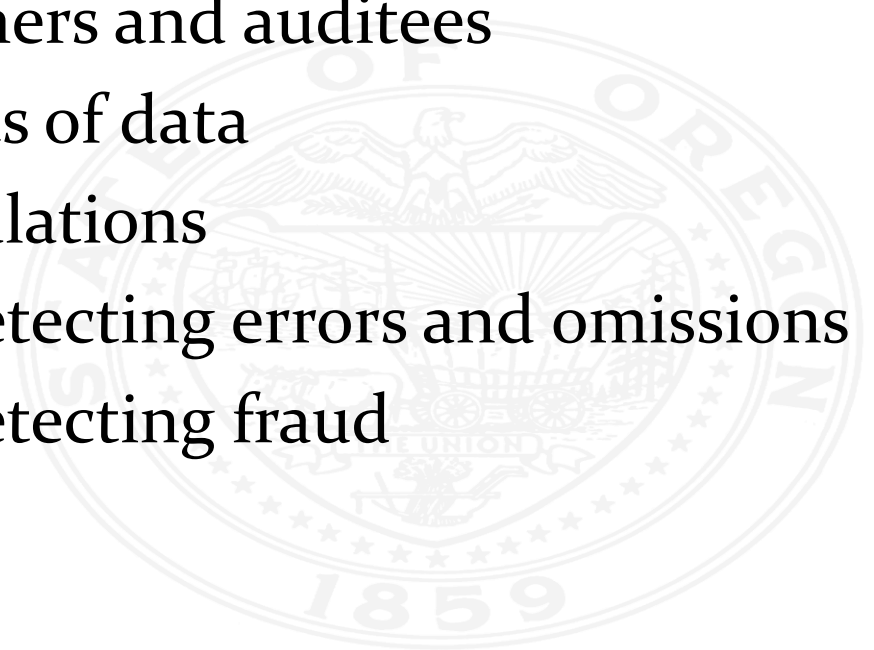
ACL

- Automatically records all of the commands that are run and the results of the procedures in its log

  - LOG feature enables automation of workpapers
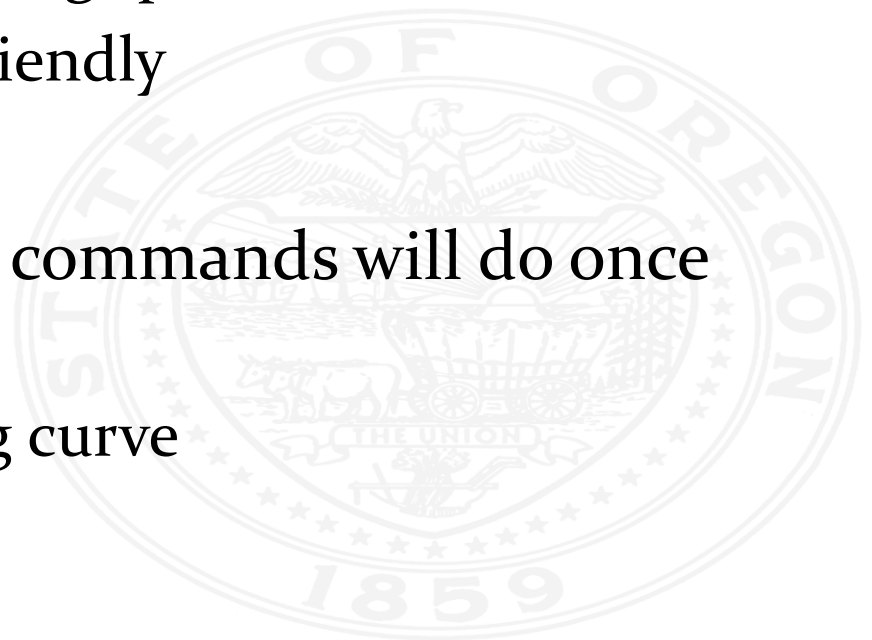 - Export the log to a word document or other file type
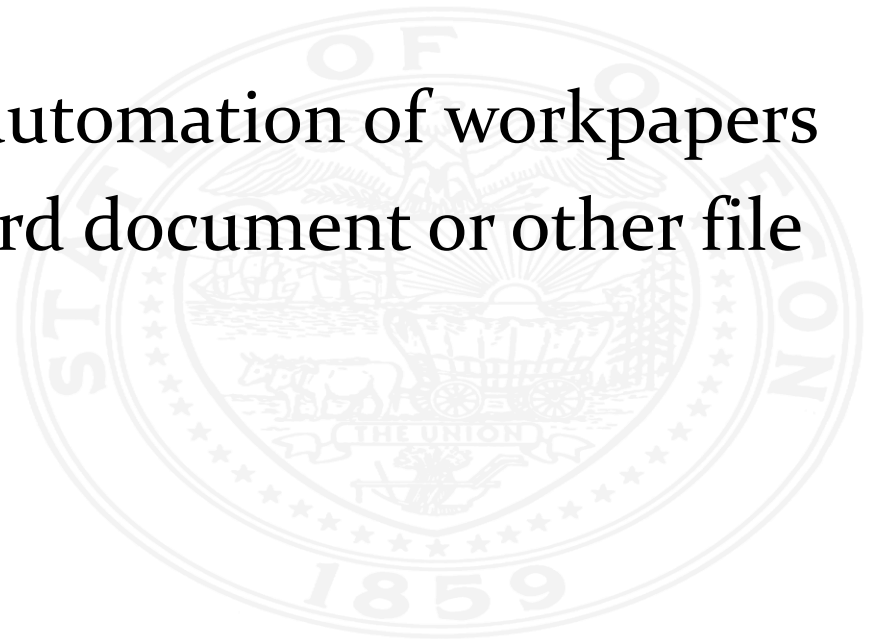
ACL

Data is locked down as read-only

- No chance of inadvertently changing the data
- Much higher risk when using spreadsheets
- Commands are auditor-friendly

Fairly easy to grasp what the commands will do once explained

- Reasonably short learning curve

ACL

- Batch feature (Writing Scripts)
- Develop audit procedures to run in ACL
- Auditor puts together the various routines in a batch (similar to a macro)
- Next time the auditor can run one command (push a button), and all of those procedures will run on autopilot with ACL dumping the results into the log
- Become much more efficient over time by running same tests periodically, adding new procedures to the batch

Stats 101 – What is an outlier?

- An outlier is an observation that is atypical – it is not normal

- Outliers can be identified through a variety of statistical tests
  - Benford's Law
  - Averages
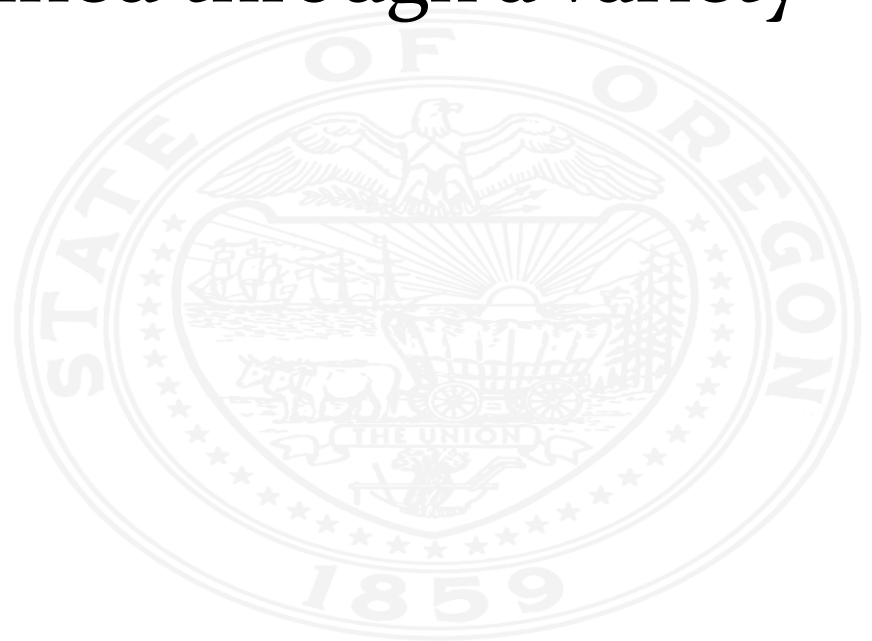
Outliers in averages
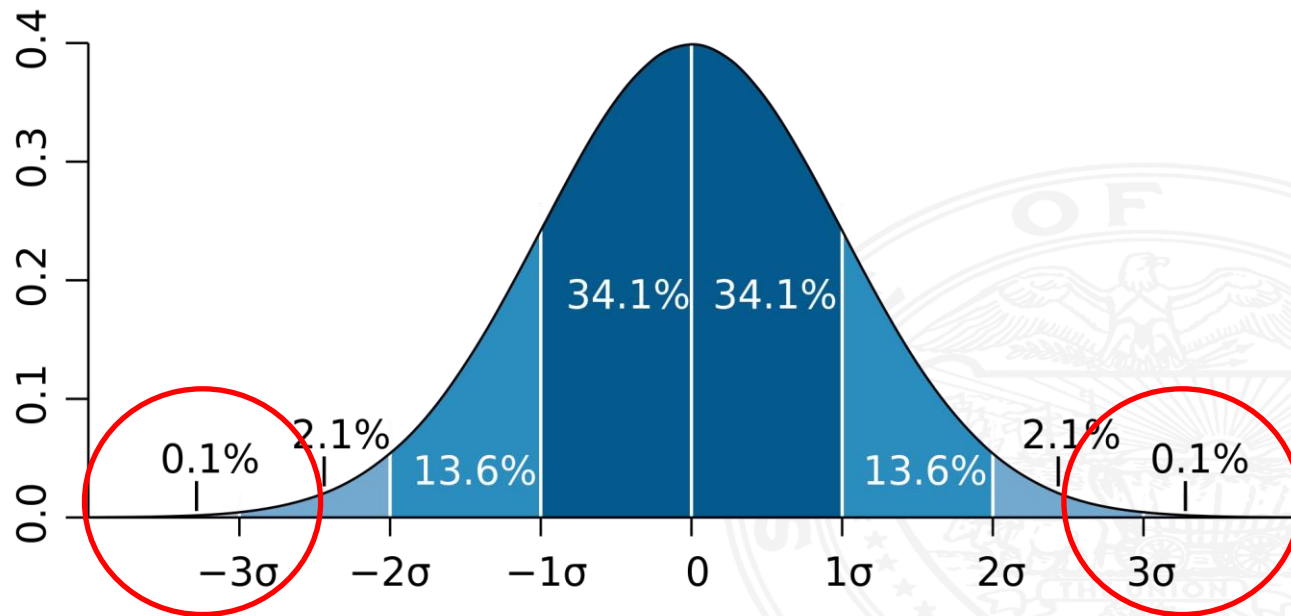
What is Benford's Law?

- Benford's gives the probability of obtaining digits 1 through 9 in specific positions of a number

- Most people assume that a given number is equally likely to be the first digit

2578

Did you know "2" occurs 17.6% in the first position

1**0**24

Did you know "10" occurs 2.1% in the first two positions
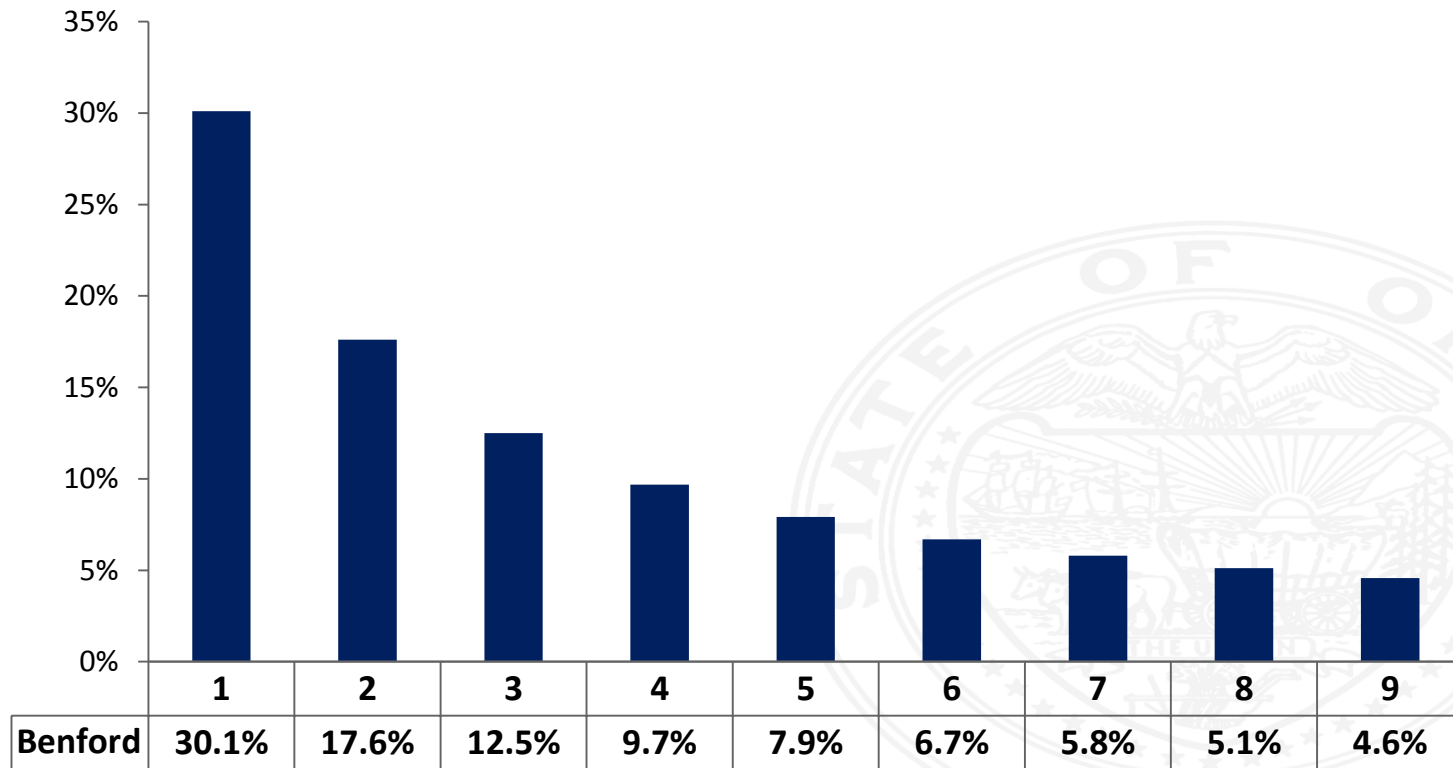
5**4**36

Did you know "4" occurs 10.0% in the second position

8598

Did you know "859" occurs 0.05% in the first three positions

Outliers in Benford's Law

- Also known as the first digit law

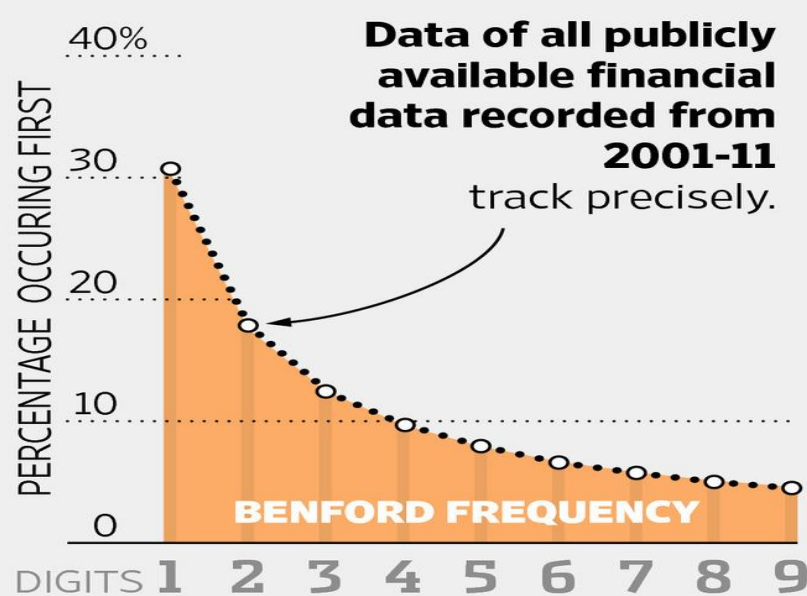|	1	2	3	4	5	6	7	8	9
Benford	30.1%	17.6%	12.5%	9.7%	7.9%	6.7%	5.8%	5.1%	4.6%

Benford's Law Uses

- Payment Information – vendor payments, travel payments, and credit card payments.
  - Example: State travel payments, excess leading digits of '24'.

- Bad Debt Write offs
  - Example: An internal auditor ran Benfords and found a spike in leading digits of '49'. Upon further investigation they found a huge fraud where the bank rep was opening up credit cards for his friends who were charging the card to just under $5,000, and then not paying on the debt. The bank rep was writing them off with no one knowing because the approval was $5,000 and over.
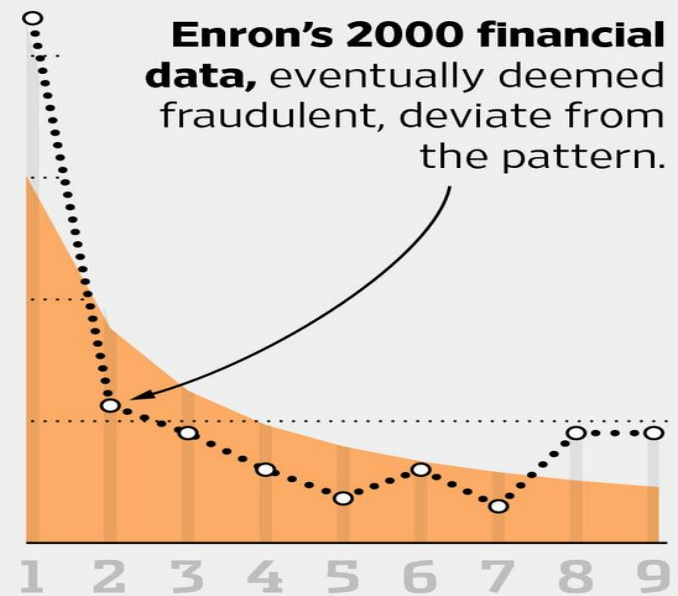
Enron Fraud

Who's No. 1?

Benford's Law expects 30.1% of numbers in a list of financial transactions to begin with '1.' Each successive digit should represent a progressively smaller proportion. Below, orange indicates the expected Benford frequencies. When digits stray from the pattern, fraud may be to blame.

Data of all publicly available financial data recorded from 2001-11 track precisely.

Enron's 2000 financial data, eventually deemed fraudulent, deviate from the pattern.

40%

PERCENTAGE OCCURING FIRST

30

20

10

0

BENFORD FREQUENCY

DIGITS 1 2 3 4 5 6 7 8 9   1 2 3 4 5 6 7 8 9

Source: Dan Amiram, Columbia University

The Wall Street Journal

13

Check Fraud/Embezzlement in Arizona

- State of Arizona vs Wayne James Nelson (1993)

- Wrote 23 checks (approx. $2 million)

- Tried to circumvent a control that required human signatures
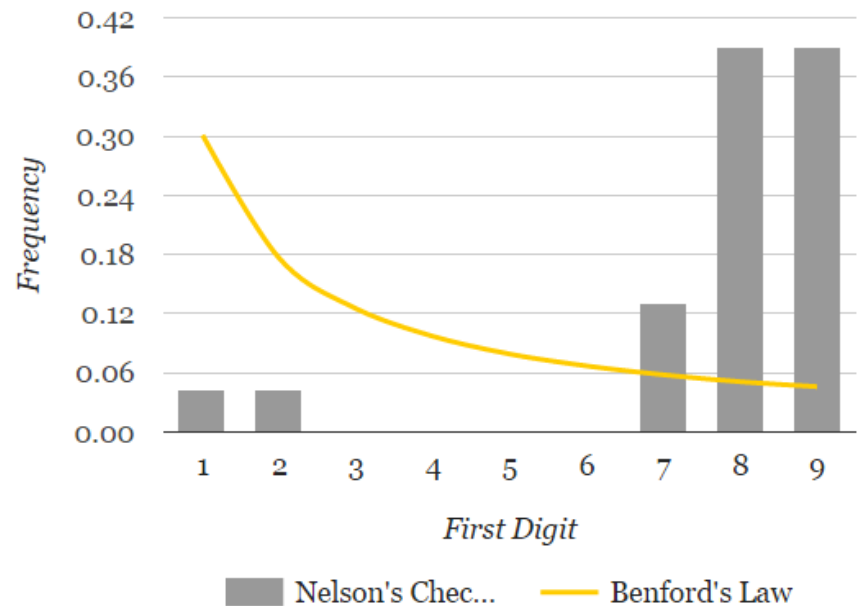
- Embezzler started small, then increased $
- Over 90% have a first digit of 7, 8, or 9

Lets put Benford's to the *test*

- Think of your home address

- If your home address begins with 1 or 2 stand up when called

- If your home address begins with 8 or 9 stand up when called

Real world applications

- Public Assistance
- TANF
- SNAP
- Child Care
- Credit Card Data

Data Matching in Audits - Matching to outside systems Child Care Audit

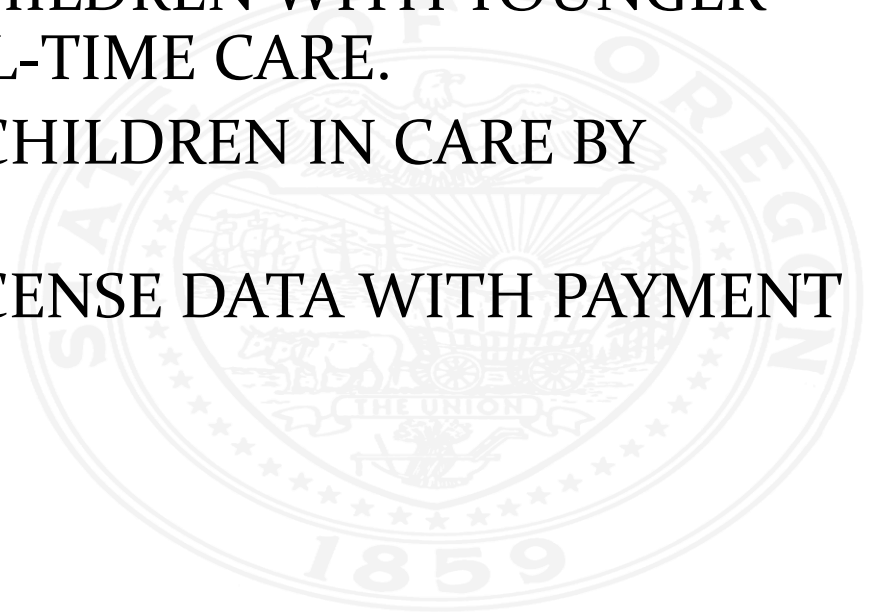Adult and Family Services Provider Data

Matched To →

OSP LEDS Warrant Data

Child Care Audit Tests

- COMPARE PROVIDER SSN TO EMPLOYMENT DATA.
- POOL OF SCHOOL AGE CHILDREN WITH YOUNGER SIBLINGS RECEIVING FULL-TIME CARE.
- COMBINED NUMBER OF CHILDREN IN CARE BY PROVIDER TYPE.
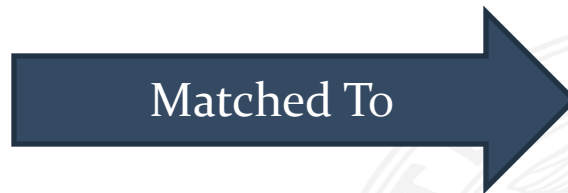- COMBINED PROVIDER LICENSE DATA WITH PAYMENT DATA.

Using Data in Audits
Matching to Outside Systems
Public Assistance Audit

1. MMIS
2. SNAP
3. TANF

Matched To →

1. SSA Death Master File
2. Inmate Listing
3. Lottery Winners
4. PERS retirees
5. Employees

Public Assistance Audit

Audit Results

Inappropriate payments to clients receiving Medicaid, SNAP, and TANF:

- Over 1,000 individuals identified as deceased receiving benefits
  - $5.3 million in Medicaid benefits
  - $1.5 million in SNAP payments
- Lottery winners who won over $30,000 and continued receiving benefits
- Over $400,000 in benefits paid out to inmates
- PERS retirees with lump sum payouts received Medicaid and SNAP
- Employees receiving Medicaid benefits while covered by state sponsored insurance

Public Assistance Audit
Audit Results

❖ 1 person won over $900,000 and continued SNAP benefits for 18 months

❖ 1 person won the lottery more than once and continued receiving benefits

❖ One retiree received over $400,000 in a lump sum payment and continued to receive Medicaid and SNAP
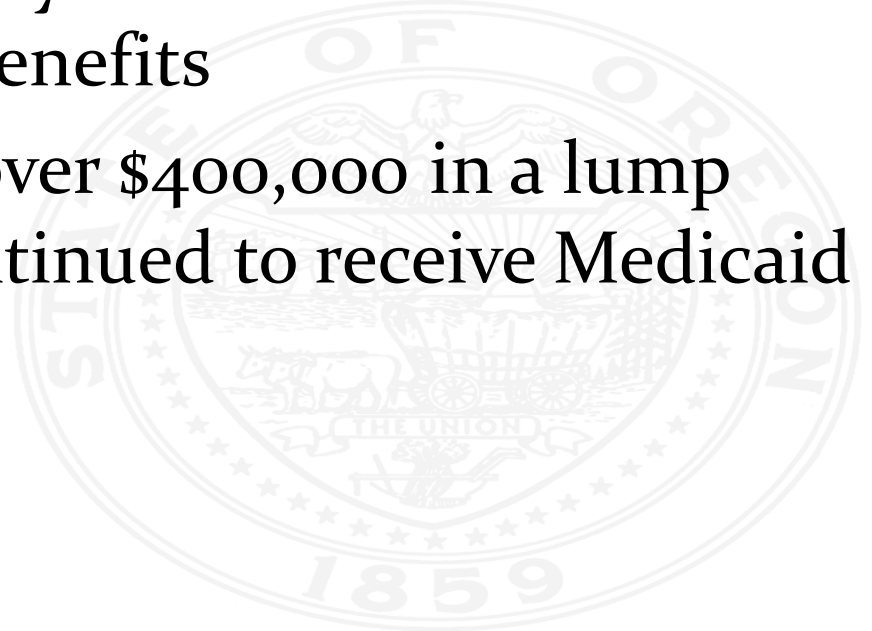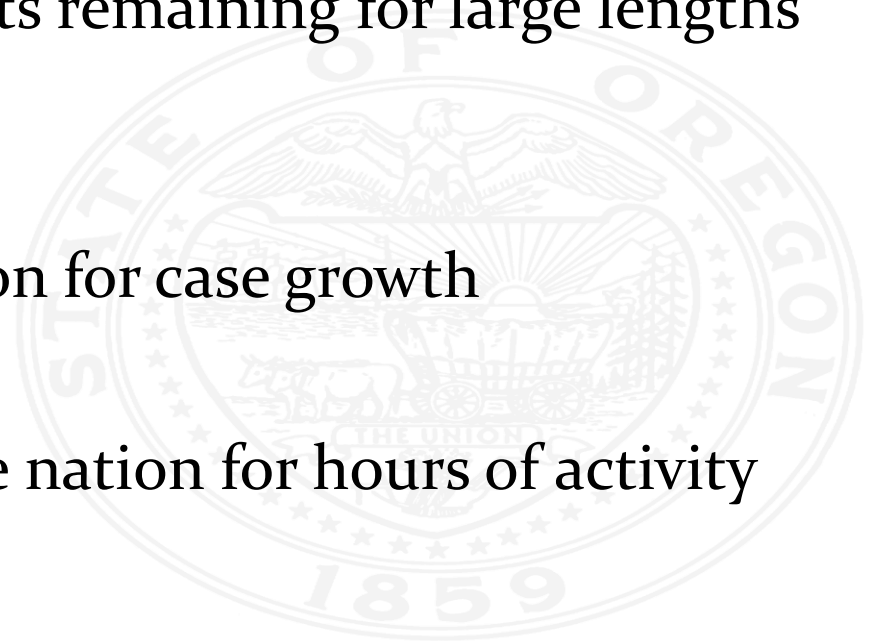
Public Assistance Audit Causes

- Large caseloads – inadequate eligibility procedures
- Inadequate SSA verification
- Categorical eligibility – assumed eligibility when receiving other benefits
- Lump sum payments – not considered income
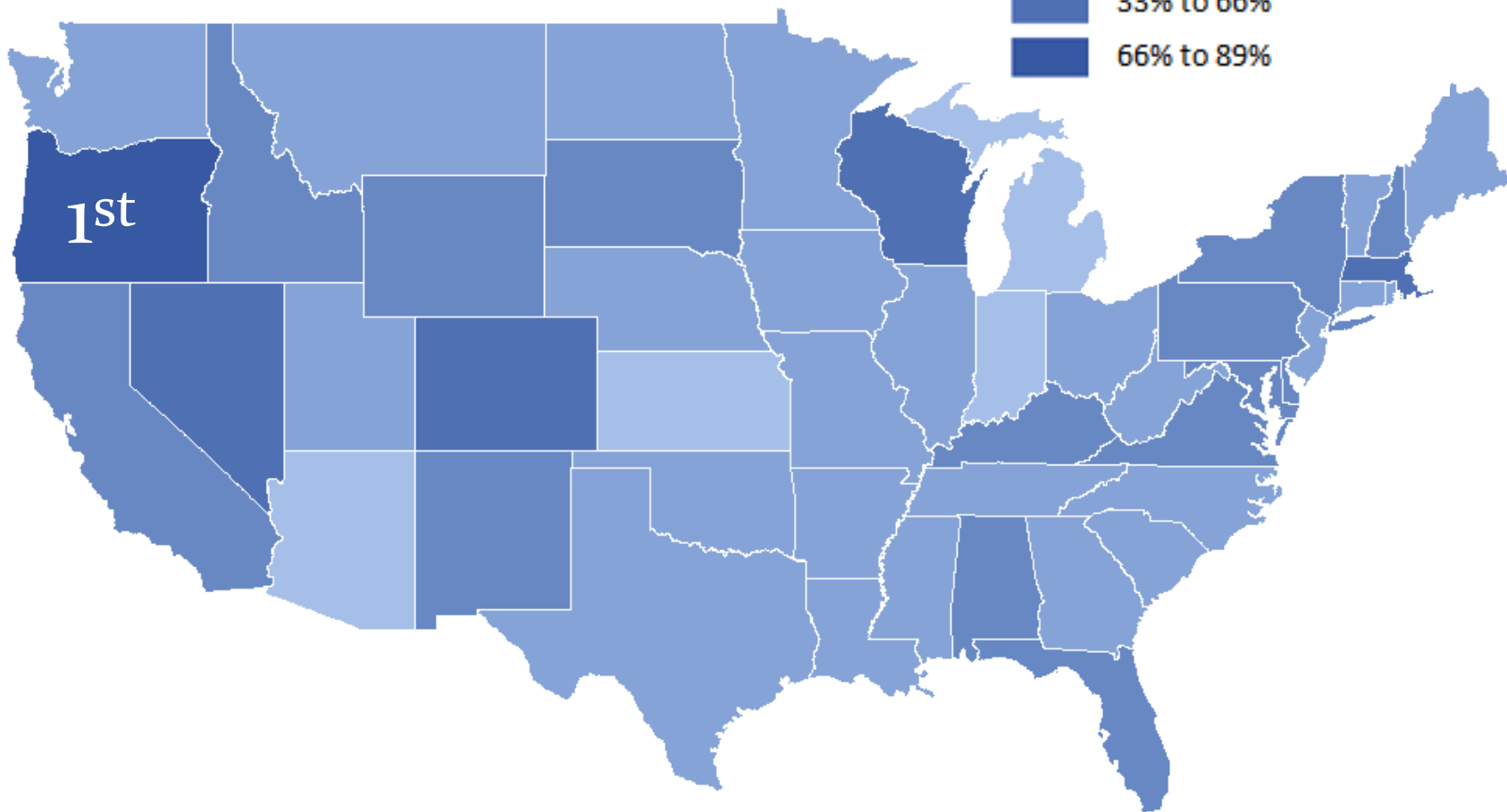- Waivers – clients are not required to report income changes for 12 months
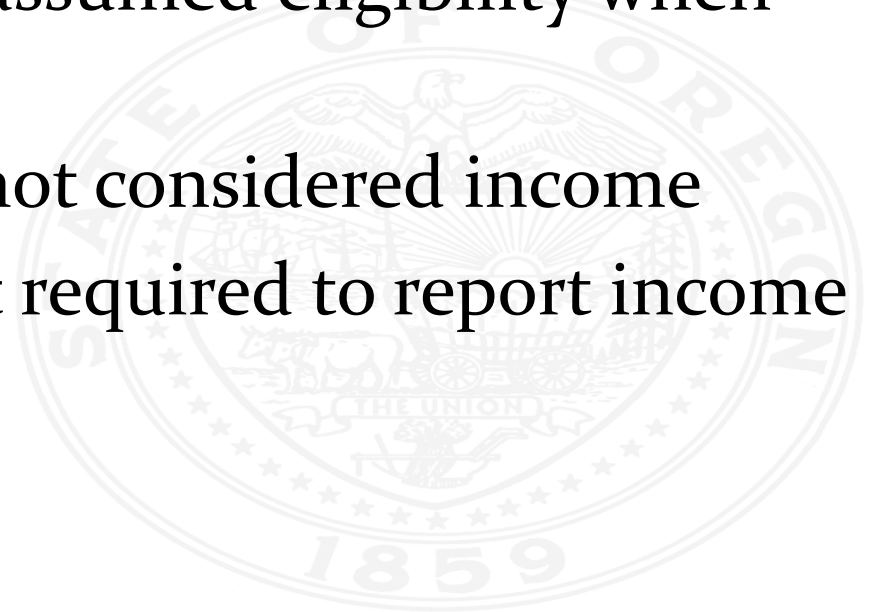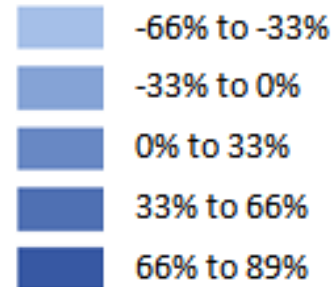
Data analysis leads to award winning TANF audit

- Data obtained during prior audits ....

  - Large caseloads and clients remaining for large lengths of time

  - Oregon ranked 1st in nation for case growth

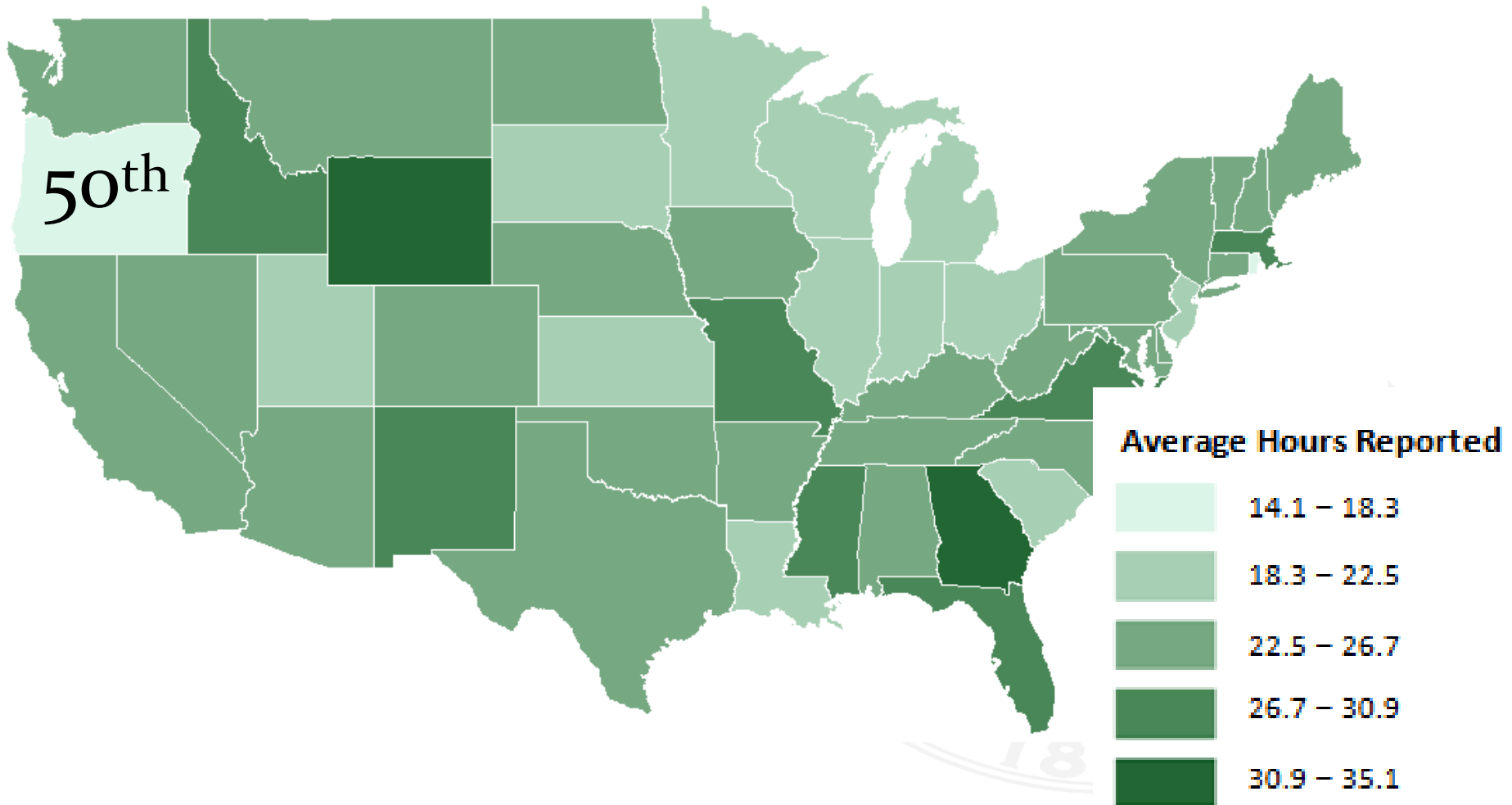 - Oregon ranked 50th in the nation for hours of activity

Case Growth Cont.

Percent Change in TANF Cases

- -66% to -33%
- -33% to 0%
- 0% to 33%
- 33% to 66%
- 66% to 89%

1st

Hours of Activity

50th

Average Hours Reported

- 14.1 – 18.3
- 18.3 – 22.5
- 22.5 – 26.7
- 26.7 – 30.9
- 30.9 – 35.1

Merging the Silos – Management Reports

Data Set 1	Data Set 2	Findings
Clients without a Diploma or GED	Clients participating in a GED program	30% of clients have not graduated from high school, yet only 2% were in a GED program
Clients identified as having a disability (learning, mental, physical, cognitive, addiction)	Clients with Case Plans and Clients by Activity	20% of clients have a disability, yet 60% do not have an active case plan. Of those with a plan, 80% have no activities.
Clients by Highest Grade Level Completed	Job Readiness Level	Clients with less than a 6th grade education were classified as "Job Ready"

More people in poverty get less help

by Yuxing Zheng
zheng@oregonian.com

An audit released this month on Oregon's dismal track record in shifting people off welfare and into jobs offers a detailed look at the effects of the recession.

The audit from the Oregon secretary of state's office includes maps and charts that illustrate the downturn's toll, including a sharp rise in welfare recipients and a reduction in state services.

The graphics also show how state cuts contributed to welfare recipients' low rate of working or looking for work. Oregon welfare recipients spent just 14.1 hours a month on work-related activities in 2010 — the lowest in the nation.

The audit, released April 16, comes as Oregon continues to struggle with high demand for cash assistance, officially called Temporary Assistance for Needy Families. About 91,400 Oregonians in 34,300 families received TANF in February, according to the latest figures from the Oregon Department of Human Services.

Data show bad news on every front for many Oregonians: Unemployment spiked from 2007 to 2009 and remains above the national rate. And most of the jobs lost in 2008-12 were middle-wage, the kind that keep families off welfare.

The jobs coming back, however, tend to be high- or low-wage, a phenomenon state economists call "job polarization."
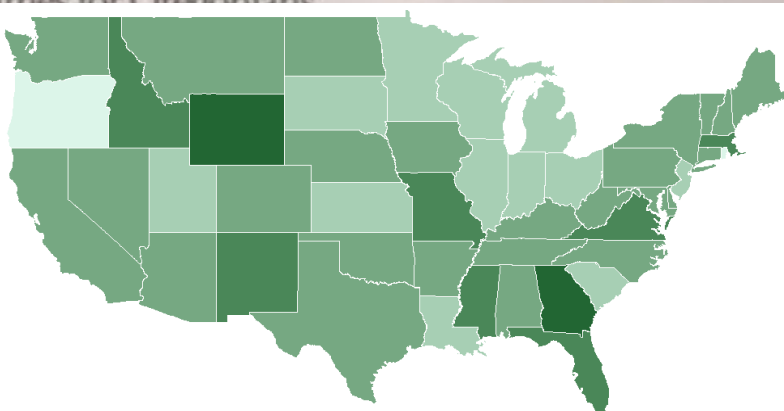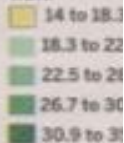
The upshot: Oregonians who used to hold middle-wage jobs are competing for lower-wage jobs that often don't pay enough to keep their
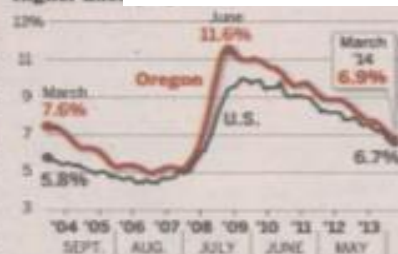
See Poverty, A8

Tough times for Oregonians

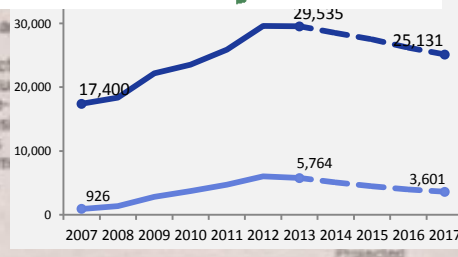**Average work-related hours per month, 2010**

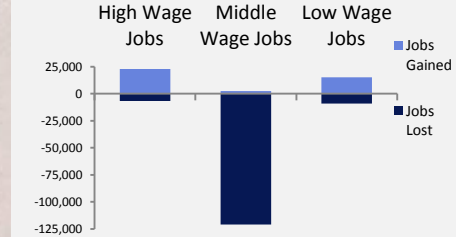Oregonians on welfare spend less time working or looking for work

- 14 to 18.3
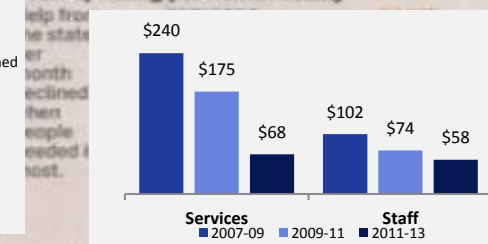- 18.3 to 22.5
- 22.5 to 26.7
- 26.7 to 30.9
- 30.9 to 35

Higher unemployment

12% — June 11.6%
Oregon — March '14 6.9%
March 7.6%
U.S. 6.7%
5.8%

'04 '05 '06 '07 '08 '09 '10 '11 '12 '13
SEPT. AUG. JULY JUNE MAY

Rolls are not projected to return to pre-recession levels anytime soon.

17,400 → 29,535 → 25,131
926 → 5,764 → 3,601

2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
Projected

Job polarization in Oregon, 2008-12

| | High Wage Jobs | Middle Wage Jobs | Low Wage Jobs |

- Jobs Gained
- Jobs Lost

25,000 / 0 / -25,000 / -50,000 / -75,000 / -100,000 / -125,000

State spending per welfare family

Help from the state per month declined then people needed it most.

Services: $240, $175, $68
Staff: $102, $74, $58

■ 2007-09 ■ 2009-11 ■ 2011-13

Sources: Oregon Secretary of State's Office, Dept. of Human Services, Oregon Employment Dept.

DAN AGUAYO/THE OREGONIAN

Sun & showers
High: 56 · Low: 44
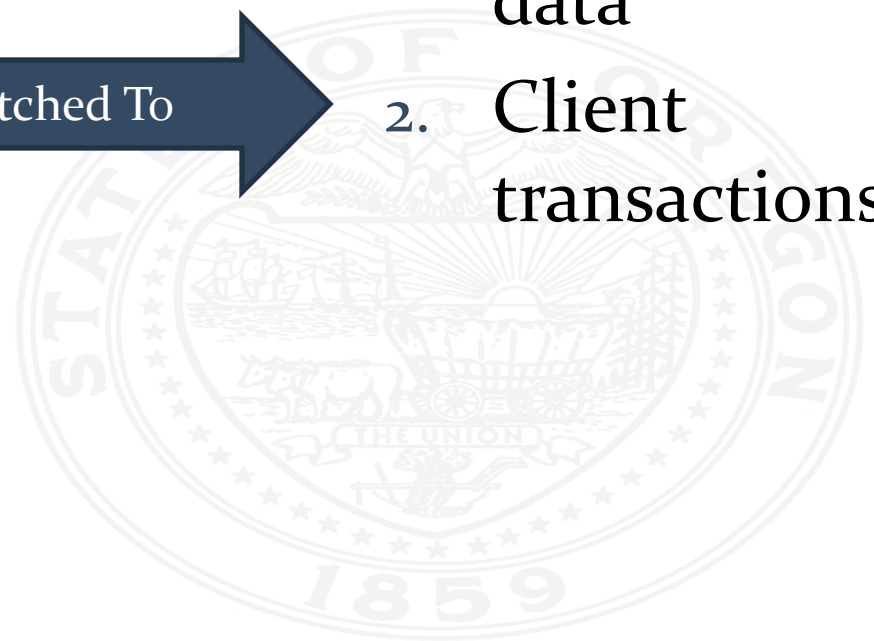Complete weather on B12

7 14170 00063 9

Data Analysis leads to a task force and multiple investigations

1. SNAP clients receiving 5 or more cards

Matched To →

1. Merchant data
2. Client transactions

SNAP Merchant Investigation

Reviewed spending patterns for high risk population of cardholders and found similar purchasing patterns:

- Same merchants
- Even dollar transactions
- Clearing the entire balance of the card
- High transaction amount
- Multiple same day transactions
- Large distances traveled (use of GIS)
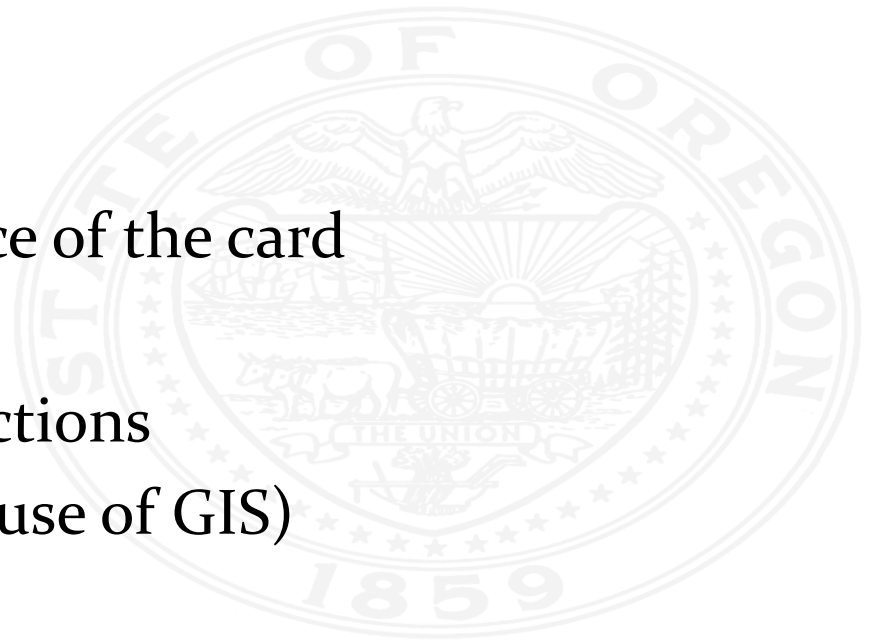
SNAP Merchant Investigation Top 30 List
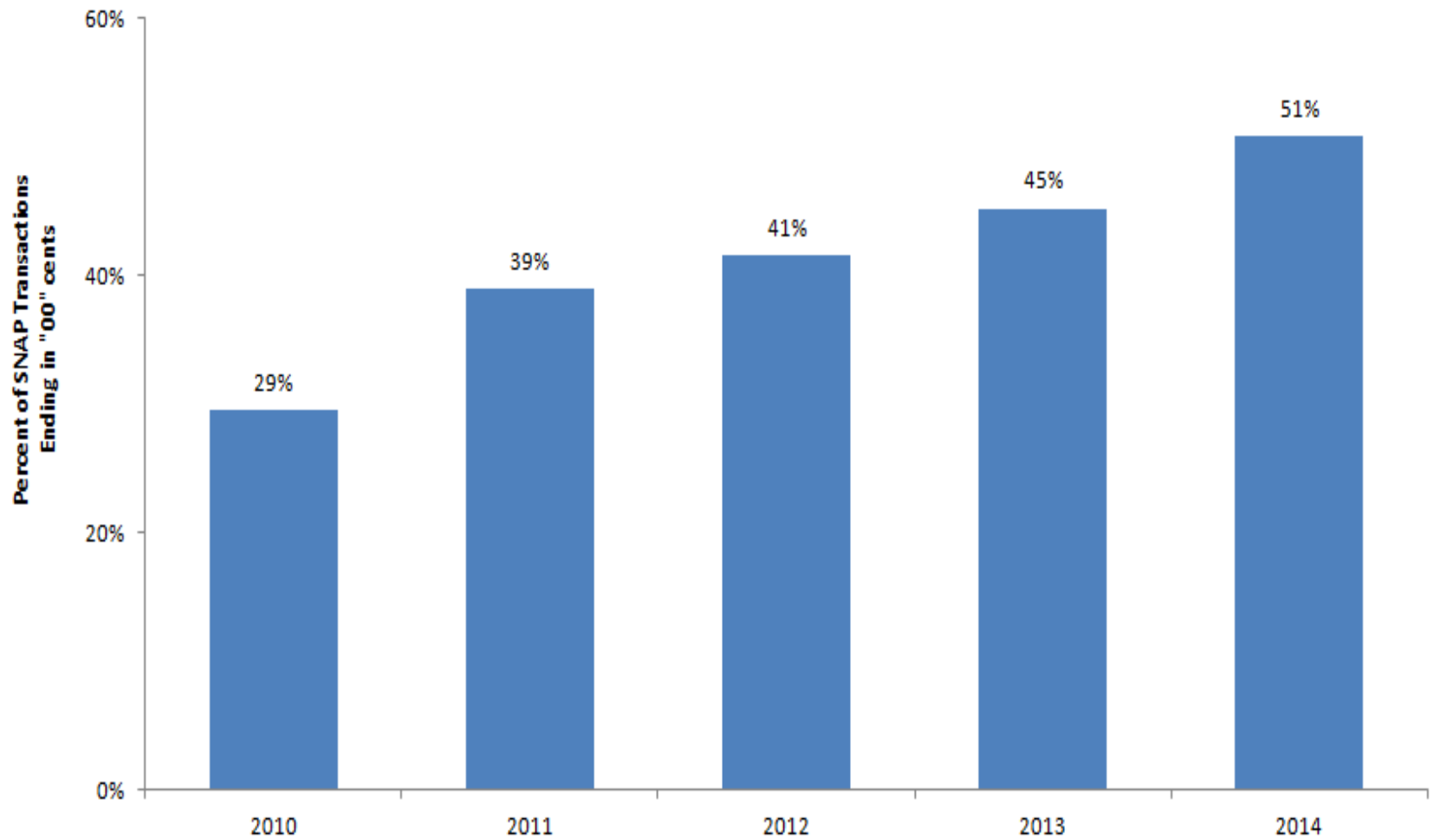
Top30Redacted.pdf

Carniceria Mi Pueblo

#1 Merchant on Our List: Meat Market in Klamath Falls, OR

Carniceria Mi Pueblo:
Percent of Even Dollar Transactions

Carniceria Mi Pueblo:
Average Transaction Amount

Real World Example
Food Stamp (SNAP) Fraud in Oregon

| Store Type	Average Transaction	Average % Even
Convenience stores Mini markets 7-11	$6	~5%
Walmart	$33	~5%
Safeway/Albertsons	$24	~5%
"Dollar" stores	$8	47%
Meat markets	$37	12%
Carniceria Mi Pueblo	$54	51%

SNAP Merchant Investigation Results to date

- 3 Merchants on the top 30 list have been investigated

- Over 200 individuals prosecuted

- Several more merchants in process

- DHS received a $300,000 grant to continue our work

- Decreased fraud from merchants around the state

Carniceria Mi Pueblo Benfords Law
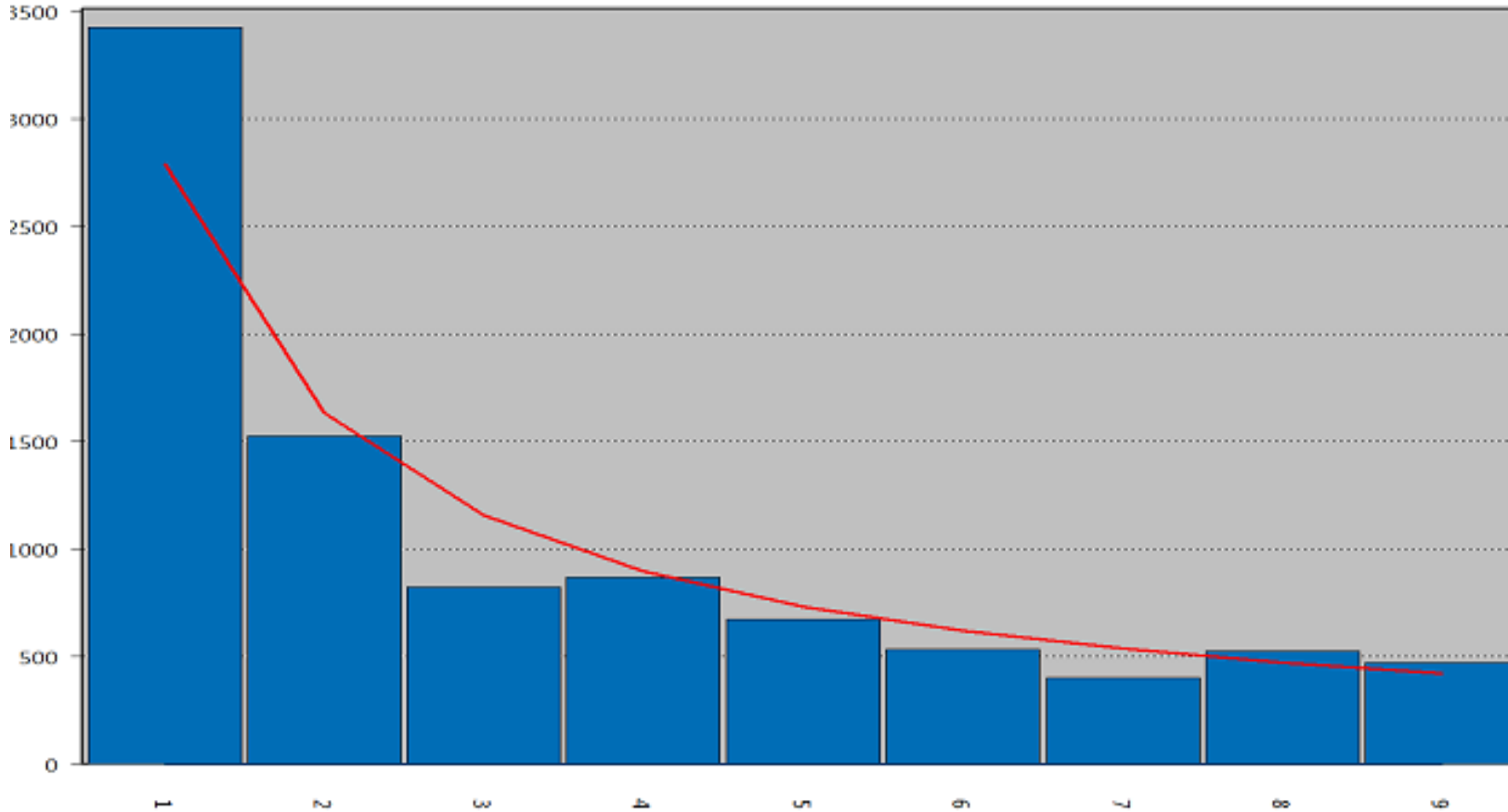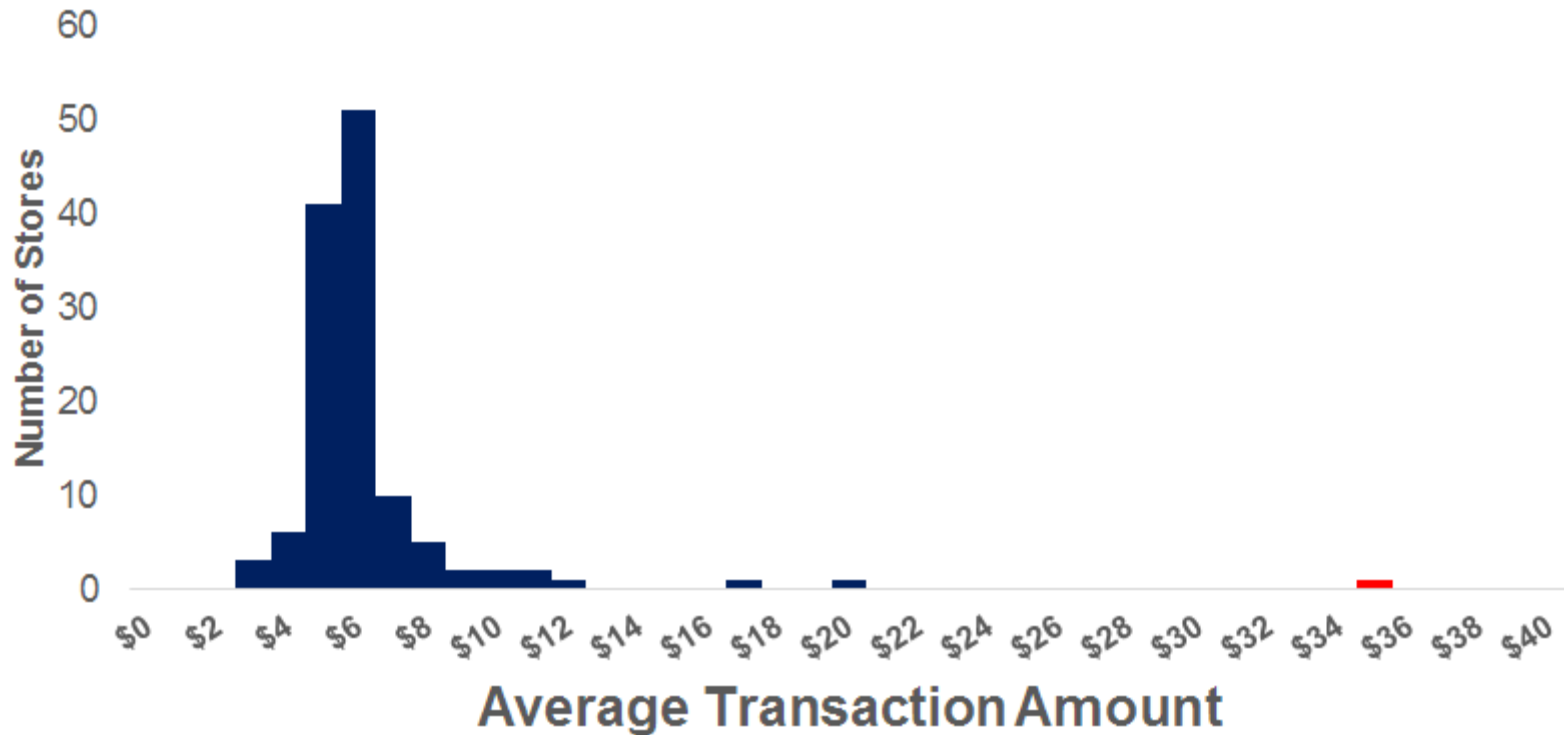
Comparison Stores Benfords Law
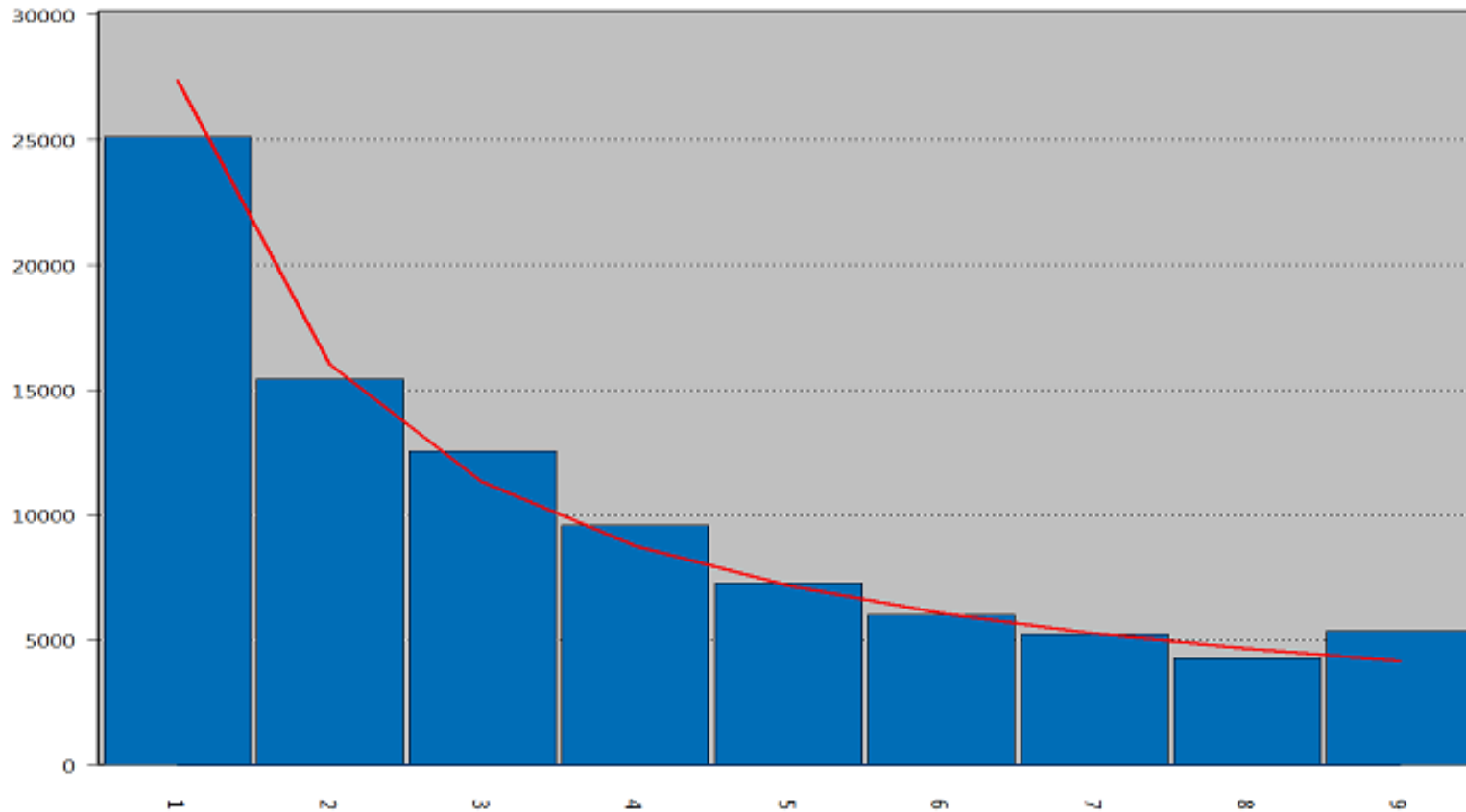
Finding those outliers….

January 1, 2016 to May 15, 2016

Seeing outliers in Purchasing

- ODOT Sign Crew – remote field office was purchasing telspar from a middle man, while every other field office was purchasing from the Manufacturer.

- Two men entered into an arrangement where the store owner would bill ODOT and receive payment for products his company did not deliver.

Sign Crew Investigation

- ODOT employee would use his purchasing authority to approve the billings for payment. In exchange for his participation he would receive good for his personal use at no cost from the Oregon Pacific Company.

- Losses from Fraudulent Billings totaled $47,000 (billing for more product than was ever received)

- Estimated losses of $42,000 as a result of noncompliance with purchasing rules (adding freight charges and increasing prices significantly)

Data Analytics in Purchase Cards

Data Mining Test Examples

- Transactions over $5,000.00
- Comparing employee city to vendor city to identify potential travel purchases
- Summarizing on employee number or ssn to identify multiple card numbers assigned to one employee
- Comparing cardholder employee numbers or ssn's to payroll data to identify terminated employees with active cards or purchases
- Reviewing transactions for even dollar amount ($20.00, $50.00, $100.00) to identify possible gift card purchases
- Review card member listing with open and closed cards to determine if employees have a history of card closures due to loss or fraud

What we find – unreasonable and unnecessary

$80 Lobster Dinners

Starbucks coffee

$20,000 playset to in-home childcare provider – led to a Vocational Rehabilitation Audit

The Monster Double Whammy Rivals The Size and Play Activities of a $35,000.⁰⁰ Park and School Commercial Playground.

Purchase Card Review often points to other problems….

- Cell phones were paid automatically on the office managers card. We found no none was reviewing cell phone bills prior to payment.

- Cell phone bills were pulled for review we were told the asset listing was not up to date.

- We reviewed cell phone costs incurred and found multiple problems…
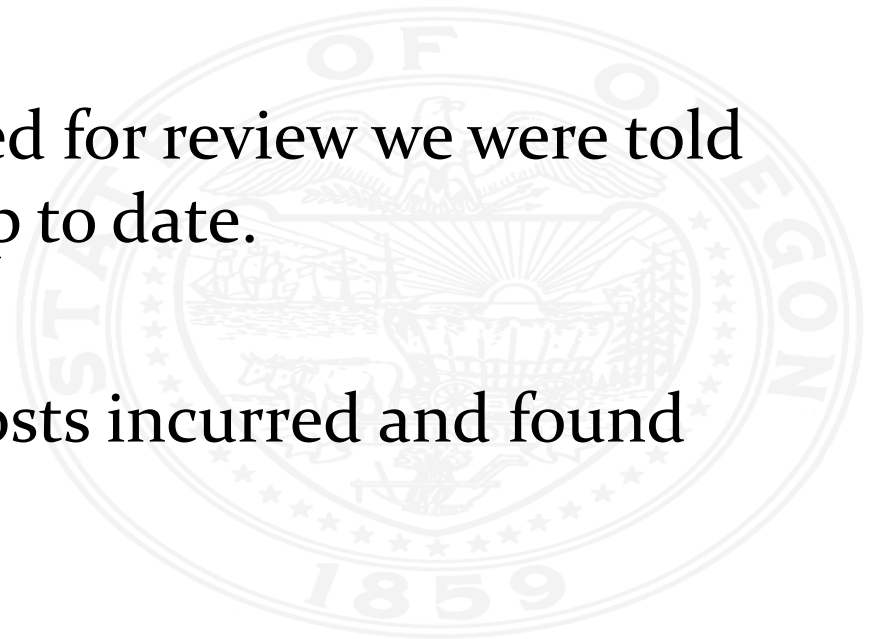
Case Example-Cell Phones

- Paying for a phone for an employee who retired two years prior

- Six phones had GPS charges when the phone plans included data

- Employees exceeded their monthly plan minutes. One cost $397.

- Phones with little to no usage

- Questioned appropriateness of 46% of the phone costs
  - $12,460 of the $27,337

Continuous Monitoring

- Be curious, use data to play around and look for anomalies and outliers.

- Regularly use Benfords Law as a first test in initial data sets.

- Combine data outside data sets together in audits and investigations.

- If needed, set up a sustainable process of continuous routing and monitoring of high risk transactions with limited manual intervention.

- Automatically document, track and monitor exceptions.

- Document and provide results via reports and dashboards.

- Information can lead to audits, investigations, or other weaknesses

Questions & Contact Info

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