Dashboard Design: Illuminating System Impact

Jesse Jorstad he/him/his
Lead Data & Program Analyst
Snohomish County Human Services

Solving Problems & Impacting Communities With Data
Jesse Jorstad
he/him/his

• Worked in homeless housing administration for 12 years
  • 5 in PSH rental admin
  • 7 total with the County
    • 2 in CoC Contract/Planning
    • 5 in HMIS/Data analytics
  • Certified in Tableau Desktop

When I’m not wrangling unruly data I spend time with these goons →

If I could quit my job and do anything I wanted, I would paint and blog and drink coffee.
I am not…

- A statistician
- A researcher
- A data viz expert
- A HUD official
- A data standards authority

My knowledge is experiential and my approach is intuitive.

With the exception of my children, I almost immediately dislike everything I have ever built. Why? Because I have acquired so many more skills and so much more knowledge than I had when I designed the project.
Evaluation
Snohomish County (WA-504)

- Unified Funding Agency
- HMIS Lead
- Staff Support for CoC Board
• Stephanie Patterson, she/her/hers
  – Steward of Data
  – Database Customization & Optimization
  – Lover of kitty cats
• Kendall Shawhan, she/her/hers
  – Federal Reporting
  – Tolerates Contract Management Staff
  – Collector of Funko Pops
• Alex Vallandry, he/him/his
  – World’s Nicest Guy, or perhaps so nuanced in his sarcasm you think he is being polite
  – User training, technical assistance and CHO monitoring
  – Plays Magic - competitively
Two Workbooks

• One from scratch
• One downloaded from here: public.tableau.com/profile/jesse.jorstad
Who else is in the room?

Raise your hand if you consider yourself primarily a...

- A database administrator
- A data entry specialist
- A data analyst
- Evaluator/Researcher
- I’m not into labels
- I am into labels, just not any of those
Who is paying you to be in the room?

Raise your hand if you work for…

- The government
- A non-profit
- A technical assistance provider/consultant
- An HMIS Vendor
- I could tell you but then I’d have to kill you
Learning Objectives

• Understand what a data dashboard is
• Understand how social capital can be expended to buy your data airtime
• Environment
• Planning a Data Project
• Common data quality issues that impact analysis
• Same data, different approach
  – Design for audience impact
• Data vizzing
Tableau Skills

- Connecting to a data source
- Joining Tables
- Altering Data Types
- Organizing the Data Pane
- Calculated Fields
- Formatting
- Getting to know your data set
- Building a Parameter
- Tooltips
What is a data dashboard?

Data Dashboards use:
- Data Visualization (Graphic Representation of Information)
  Why?

At the beginning of the period, 1,250 households were enrolled in coordinated entry. During the period, 3,035 entered and 2,894 exited. At the end of the period, 1,391 remained.

Humans process visual information **60,000** times faster than text.

Not all data visualization is a dashboard

- Charts
- Infographics
- Reports

*When someone experiences a housing crisis, they can access services through Coordinated Entry*
WHO IS GETTING HOUSED THROUGH CES?

If 100 people contacted CES...

- 44 Prevention Assessment
- 31 Housing Roster
- 56 Housing Assessment
- 24 Community Based
- 7 Referral to homeless housing
- 69 Other/Unknown
Dashboards facilitate clear take away messages…

…but allow the user to interact with the data. These interactions:

- Foster engagement
- Conveys the relationship between Key Performance Indicators (KPIs)
- Promotes analysis
- Moves audience to action
Why do people distrust data?
Write down 10-ish words that you think people would use to describe you

Write down 3 words that you wish people would use to describe you
Before using data to change anything…

…you have to build relationships
Network of Relationships

Social Capital as Currency

Realization of goals

Respect, appreciation, integrity, trust and shared values

New knowledge and resources

socialcapitalresearch.com
Break Time
Your Environment
You can’t do it alone

data posse

my boss

director

contract managers

DAC

contracts supervisor

other HMIS admins

specific board members

internal allies

external allies

other supervisors
## Evolution of Data-Driven Culture

<table>
<thead>
<tr>
<th>System Impact</th>
<th>Mostly agitation</th>
<th>Agencies understand own performance</th>
<th>System performance understanding</th>
<th>Empowered policy changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oversight</td>
<td>On-site file audits</td>
<td>Project-specific outputs</td>
<td>Agencies report in</td>
<td>Uniform reports, uniform objectives</td>
</tr>
<tr>
<td>Data Stewardship</td>
<td>Waiting around for data</td>
<td>Canned reports, ad hoc queries</td>
<td>Replicable exports</td>
<td>Updates and maintenance</td>
</tr>
<tr>
<td>Communication</td>
<td>Focused on expectations</td>
<td>Data quality &amp; project performance</td>
<td>How the system functions</td>
<td>Open and reciprocal</td>
</tr>
<tr>
<td>Analysis</td>
<td>Are users even logging in?</td>
<td>Project-level, ad hoc</td>
<td>System Level</td>
<td>Project type, population level</td>
</tr>
<tr>
<td>Value</td>
<td>Anticipated, but not realized</td>
<td>Validation of beliefs</td>
<td>Testing of anecdotal theories</td>
<td>Observe impact of policy changes</td>
</tr>
<tr>
<td>Coverage</td>
<td>Limited to the brave or obligated</td>
<td></td>
<td>Voluntary Partners</td>
<td>Non-traditional partners</td>
</tr>
<tr>
<td>Participation</td>
<td>Resistant</td>
<td></td>
<td>Increased proficiency, decreased resistance</td>
<td></td>
</tr>
<tr>
<td>Standards</td>
<td>Thin and limited</td>
<td></td>
<td>More substantial, more nimble</td>
<td>Closer to “real life” data</td>
</tr>
</tbody>
</table>
Decision Points and Opportunities

Data Collection Mechanism

User Interface

Raw Data Tables

Extraction Mechanism

interesting stuff happening in the world

Visualize

Analyze

Transform

Export

File not ready for analysis

2019 Fall Conference
Austin, TX
October 15-17, 2019
Table Joins

- Inner
- Left
- Right
- Full Outer
### Inner Join - Only matching values from Table 1 and 2

<table>
<thead>
<tr>
<th>Favorite Animal</th>
<th>Person</th>
<th>Number of dogs</th>
<th>Number of cats</th>
<th>Horses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unicorn</td>
<td>Jesse</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wolf</td>
<td>Kendall</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Shark</td>
<td>Alex</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cat</td>
<td>Stephanie</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

### Left Join - All values from Table 1, only matching values from Table 2

<table>
<thead>
<tr>
<th>Favorite Animal</th>
<th>Person</th>
<th>Number of dogs</th>
<th>Number of cats</th>
<th>Horses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unicorn</td>
<td>Jesse</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wolf</td>
<td>Kendall</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Shark</td>
<td>Alex</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cat</td>
<td>Stephanie</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Gecko</td>
<td>Jackie</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Outer Join - All values from Table 1 and 2

<table>
<thead>
<tr>
<th>Favorite Animal</th>
<th>Person</th>
<th>Number of dogs</th>
<th>Number of cats</th>
<th>Horses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unicorn</td>
<td>Jesse</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wolf</td>
<td>Kendall</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Shark</td>
<td>Alex</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cat</td>
<td>Stephanie</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Gecko</td>
<td>Jackie</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Gecko | Jackie

### Right Join - All values from Table 2, only matching values from Table 1

<table>
<thead>
<tr>
<th>Favorite Animal</th>
<th>Person</th>
<th>Number of dogs</th>
<th>Number of cats</th>
<th>Horses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unicorn</td>
<td>Jesse</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wolf</td>
<td>Kendall</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Shark</td>
<td>Alex</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cat</td>
<td>Stephanie</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Gecko</td>
<td>Debbi</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Practice Joining Tables

page 8
Getting to Know Tableau
Dimensions

Discrete = Categorical, Countable

- Finite number of values
- Counted, not measured

Examples:
- Age group at entry
- Favorite color

Total households by score

- High: 217
- Medium: 428
- Low: 832
- No Points: 168
## Measures

- **Continuous** infinite number of possible values
- **Quantitative** measured, not counted

**Examples:**
- Age
- Income
- Days in Program
Practice – Altering Data Types

page 9
Measure to a Dimension

Converting Numeric Field to a String Field

Changing default formatting
Practice – Organizing the Data Pane

page 10
Organizing your workbook

- Open a search box: Ctrl+f
- Type: Date
- While pressing Ctrl, select:
  - EntryDate
  - ExitDate
  - MoveInDate
- Right click -> Folders -> Create Folder
- Name it: Enrollment Date
- Repeat for all other dates, put in new folder “MetaData”
Break Time
Let’s talk about data project planning
Data Visualization

- Opportunity to practice...
  - communication skills
  - patience
  - iteration

Can you build us a swing?

projectcartoon.com
Project Planning Overview

Your role  Accuracy  Context
Audience  Utility  Clarity
Timeframe  Granularity  Interactivity
Project Plan  Data Source  Metrics

^ What’s wrong with this visualization?
YOUR ROLE

Make the dashboard support your stakeholders’ agenda

Leave the summary analysis entirely to the user

1. Make it accurate
2. Make it clear
   • Dashboards allow users to find their own takeaways. Set them up for success.
3. Make it useful
   • It is your job to be the expert. You won’t always have the answers, but when you do, share them.
   • Try to prevent inaccurate interpretation.
Tell me about this chart

The most preferred color of people surveyed

- Purple
- Red
- Blue
- Orange
- Green
- Yellow

Get to the point

Color should add meaning

3D ...just no.
Favorite Color

- Sorted by value
- Color correlates with meaning
- Drop meaningless text
All the math in the world can’t replace context

- How were the data collected?
  - How does the quality and accuracy vary throughout the set?
    - Some questions are harder to get accurate answers for
    - Data entry can vary by user and their own value judgments
- How have the data fields evolved?
  - Understanding and Definition
- What policy changes have occurred during the lifetime of the data set?
Data Visualization Project Plan Template

- Stephanie made you all a present. See Attachment A of your manual.

- PS Stephanie – I made some changes.
What are you building?

- Dashboard
  - Single Screen, all in one view
    - Example: https://public.tableau.com/profile/snocohmis#!/vizhome/HeatMapbyAgency/Master
  - Scrollytelling, single screen but additional information as you scroll
  - Multi-screen
    - https://public.tableau.com/profile/snocohmis#!/vizhome/SnohomishCountyRapidRehousing/SelectParameters
- Delivery Mechanism
  - How often will folks want to print this product?
    - Impacts Interactivity
    - Tooltips
Planning The Audience

Internal
- Data Team
- Contracts Team
- Immediate Supervisor
- Boss’s Boss

External
- Partner Agencies:
  - Direct Service
  - Leadership
  - The Community
  - Funders
  - Elected Officials

What do they do?
1. Connect
2. Identify shared values
3. Build on what they know

Time to generate and spend social capital
1. Connect
2. Identify shared values
3. Build on what they know
I want people to...

- Realize how awesome I am
  >> Be fancy
- Be better informed
  >> Be clear and concise
- Answer their own questions
  >> Plan for what they want to know
- Be inspired to ask more questions
  >> User friendly and interactive
- Take action
  >> Be clear about the problem
Overall, the number of households experiencing homelessness was up almost 14% since Q1 of 2017.
Planning

Data Source

- Do you have a data source identified for this project?
  - How often is it refreshed?
  - Does it need to be altered to meet the need?
Pause and reflect

• How much time will this take to build the first time?
• How much will it take to refresh?
• How much documentation is needed?
• How thoroughly will it meet the need?

• Is it worth it?
Planning

Timeframe

- What is the timeframe of interest (most recent month, quarter, year)?

- Are you presenting point-in-time (snapshot) or trends?
  - If trends, what is the total time period (i.e. 2014 to present)
Planning Grains

• By…
  – Household
  – Person
  – Enrollment

• For all who _____ during the period
  – Entered
  – Active
  – Exited
  – Moved in

All household types or only...
• Families (adult/child)
• Adult Only
• Child Only
Planning Interactivity

- Parameters
- Filters
- Actions

Size of universe will dictate the types of interactivity that are useful.

Summary statistics (like “average”) are of very limited utility with n < 20-30.
Planning

Types of Parameters

Viz tip: Consider combining, hiding or excluding categories that are less than 5% to make charts more meaningful and easier to read. Make sure to add a note so the audience is clear.
### Planning Metrics

- How do you decide what the key performance indicators are?
- Who can help you develop the specifications for the measures?

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Assess Options</th>
<th>Narrow Options</th>
<th>Consider Other Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do you think is likely to happen?</td>
<td>Are you collecting data you can track to see if you are right?</td>
<td>Eliminate redundancy.</td>
<td>Is there a scenario where what I am measuring might indicate the hypothesis is not true, but it in fact is?</td>
</tr>
</tbody>
</table>

Get to know your neighbor
Consider Other Factors – What do I mean?

• We are funding an SSO project under YHDP.
• The community selected this project to bridge gaps between systems that youth are accessing.
• But how does that impact homelessness?
  – I think that if the project works as intended we will see a decrease in the number of unaccompanied minors who experience unsheltered homelessness.
• What are the risks of centering performance around experiencing unsheltered homelessness?
Dashboard Disclaimers

- Leveraging the CSV has limitations
  - Metrics with complex logic could not be included because it would have negatively impacted performance (of the dashboard)
  - I designed the data source to require minimal manipulation for ease of data refreshes
  - I wasn’t able to include night-by-night shelters because of the structure of the services file in Days Homeless in Homeless projects.
  - The measures on this dashboard were heavily influenced by what was available.
  - I have worked to QA this thing but I am not responsible for the accuracy of this dashboard. Please do your own quality assurance.
That being said, I found an error late Sunday night but I fixed it.

Solution →

\[
\begin{align*}
n-2 \text{ PH Attained} \\
\text{IF } [\text{Demographic Parameter}] = 'Any' \text{ then null else} \\
\text{COUNTD(IF ISNULL([Calc Demographics])} \\
\text{AND [Period - Exit] = TRUE} \\
\text{AND [Living Situation Category] = 'Homeless'} \\
\text{THEN [Enrollment ID]} \\
\text{ELSEIF ISNULL([Calc Demographics])} \\
\text{AND [Move In During Timeframe (LOD)] = TRUE} \\
\text{AND [Living Situation Category] = 'Homeless'} \\
\text{THEN [Enrollment ID] ELSE null END)
\end{align*}
\]
Z-score, what does this deviant mean?

A Z-score is the number of standard deviations from the mean (average) a data point sits. This is a way to compare results from a test to the “normal” population. Say your Z score is 0, this indicates it is identical to the average. Whereas a -3 means it is 3 standard deviations to the left on a bell curve and +3 is 3 to the right.
95% Confidence Interval

Whoa there! This does not mean that we going to be correct 95% of the time, probability math is different.

The 95% indicates that a majority of our experiments will include the true mean, but 1-in-20 (5%) will not.

We measure the height of 40 random men, they have a mean height of 5’8”. The standard deviation is +/- 3 inches. This indicates the true mean of ALL men’s heights in Texas is likely to be between 5’5” and 5’11”.

But it might not be!!!
That was exhausting – Break Time
Design

The Layout: Resources

- Tableau Data Dashboard Webinar
- The Big Book of Dashboards
- The Data Visualization Checklist

In short:
- Don’t make it weird
- People view a dashboard like they read a book
  - Left to right
  - Top to bottom
- Leverage BANs for impact
Using color with consistent meaning

It’s kind of a funny story...
Four types of relationships

Design

Data Viz Checklist

*Developed by Stephanie Evergreen and Ann K. Emery*

- See Attachment B in the manual
- Go to Tableau Public Gallery ([public.tableau.com/gallery](http://public.tableau.com/gallery))
- By yourself, or with a partner, find a viz
- Critique the viz using the tool (Data Viz Checklist)

Design

What not to do

• Use decimal points needlessly
• Use more than 2 fonts
• Use color in contradicting ways
• Bury the lead
• Rule out crosstabs
Practice – Calculated Fields
Calculated Fields

You can create calculations to summarize your data

You can search for functions

ABS(number)
Returns the absolute value of the given number.
Example: ABS(-7) = 7
Other Examples of Calculated Fields

Start Date HARDCODE

\[
\text{DATE('10/1/2010')}
\]

Exit During Timeperiod

\[
\text{[Exit Date] >= [Start Date HARDCODE] and [Exit Date] <= [End Date HARDCODE]}
\]

LOD Exit Income

\[
\text{\{fixed [Enrollment ID]:}
\text{\quad \text{MAX(IF [Data Collection Stage] = 3 }}
\text{\quad \quad \quad \quad \quad \quad \quad \quad \quad \text{THEN [Total Monthly Income] ELSE NULL END)\}}
\]

Change in Entry/Exit Income

\[
\text{IF [Period - Exit ed] = TRUE}
\text{\quad THEN [LOD Exit Income] - [LOD Entry Income]
\text{\quad ELSE NULL END}}
\]
Practice – Formatting

page 12
Same Data, Different Approach

Average number of days between project entry and move in date

Accumulative

While a line chart may be appropriate, people are better able to see the difference in the height of a bar than the degree of angle change shown in a line chart.

Tip: Aim for a 45° angle from the lower left corner to the upper right
Same Data, Different Approach

Average number of days between project entry and move in date

Based on this chart, performance is going the wrong direction.

But in exploring the data, we see that the Median is 36.

What does that mean?

Joke
This tells a contract manager that they met their benchmark 39% of the time.

This tells the agency there is likely a date that was entered incorrectly.
To the Point

Move In Within 28 Days

% Goal Met vs Not Met
Displays only data for move-in dates which occurred since the beginning of the program year.

39% 61%

Average: 59
Median: 36
Practice – Getting to Know Your Data Set

page 13
Getting to know your data

• Number of Records
  – HouseholdID
  – PersonalID
  – EnrollmentID
  – UserID
  – OrganizationID
  – ProjectID
  – IncomeBenefitsID

• Why it matters:
  – Example: TotalMonthlyIncome
Common Data Quality Issues

• Who is in charge around here?
  – No head of household
  – More than 1 head of household
  – Wrong person assigned as HoH (minor dependent child)

• Dates
  – in the future
  – Move in prior to enrollment
  – Missed move in date
  – Birthdate after enrollment
  – Who are all these 119 year olds? Birthdate 1/1/1900
Common Data Quality Issues, continued

• Exits
  – Missed exits
    • Everyone was exited except for the minor dependent child
  – Rogue data user starts utilizing Destination option of “Other” and only writes, “Texas” or “Rapid Rehousing”
  – HUD creates an exit destination of “No exit interview completed” and users think that if they didn’t do something literally called an “exit interview” they should select this option
Common analytical issues

- 57% of people exited to permanent housing
- 45% of people exited to other
- 102%

A household moved into housing in (~359) days.

- A child was (~39) days old at entry.

- In a 30 day period someone was enrolled for 43 days.

- There is an unaccompanied minor in a project that doesn’t serve this population.
Let’s recreate some vizzes!!!!
Contact Information

Jesse Jorstad
Jesse.Jorstad@snoco.org

Public.tableau.com/profile/snocoHMIS
Public.tableau.com/profile/jesse.jorstad

Twitter: @JesseJorstad