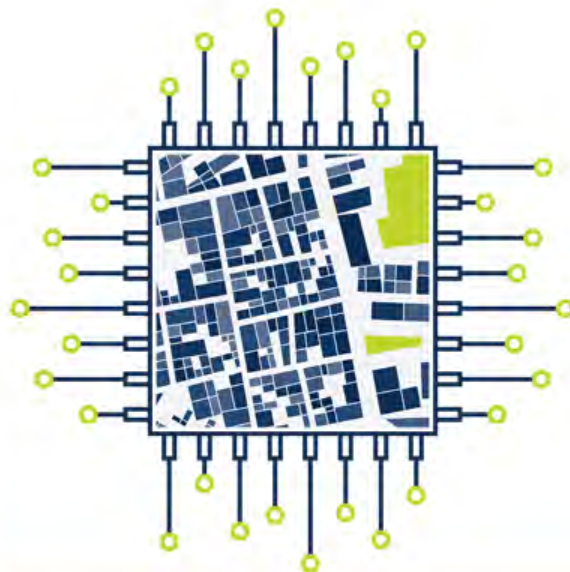


## Dashboard Design: Illuminating System Impact

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



Solving Problems &  
Impacting Communities  
With Data



Snohomish County



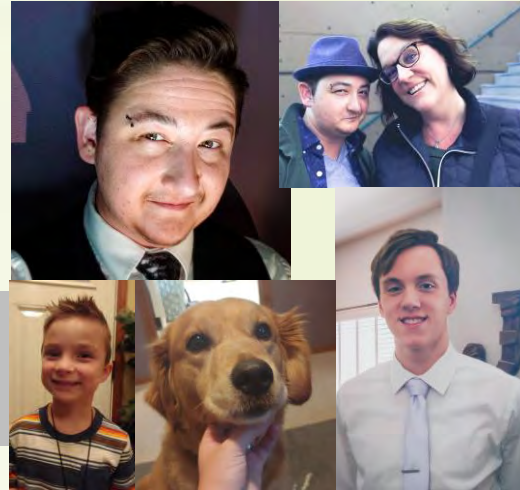
# Jesse Jorstad

*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

*If I could quit my job and do anything I wanted, I would paint and blog and drink coffee.*

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



*Evening Comes*

THAT'S  
TEK  
MISGENDER  
^  
TO YOU

[mrgender.blog](http://mrgender.blog)



## 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.*

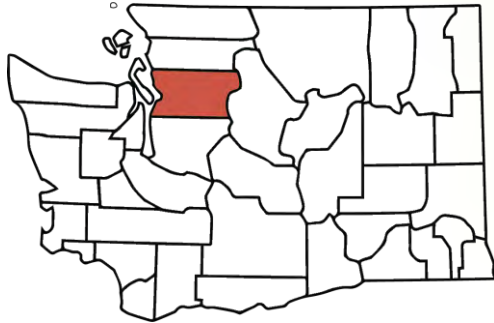
With the exception of my children, I almost immediately dislike everything I have ever built. Why? Because I have acquired so many more skills and so much more knowledge than I had when I designed the project.



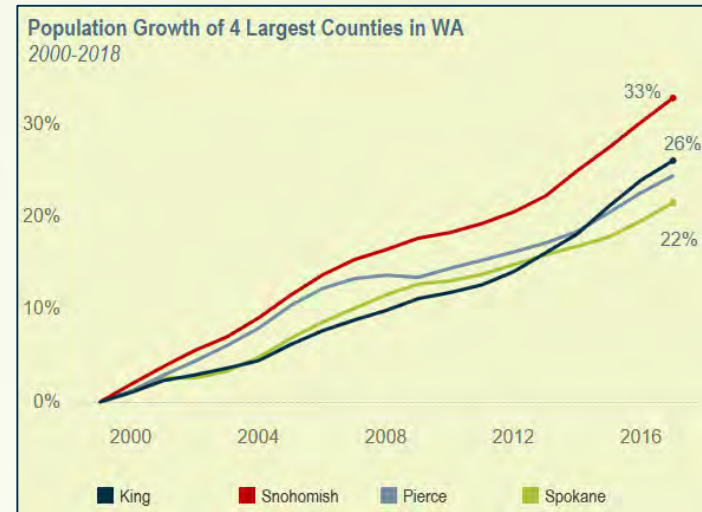
# Evaluation



# Snohomish County (WA-504)



- Unified Funding Agency
- HMIS Lead
- Staff Support for CoC Board





# SNOHOMISH



- **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](https://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



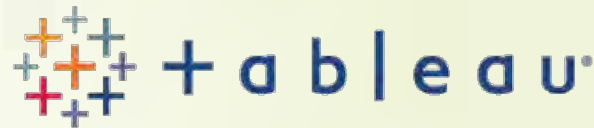


# Learning Objectives

- 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





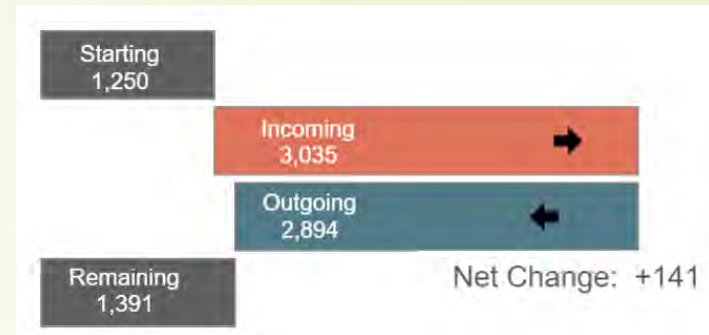
# What is a data dashboard?

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.*

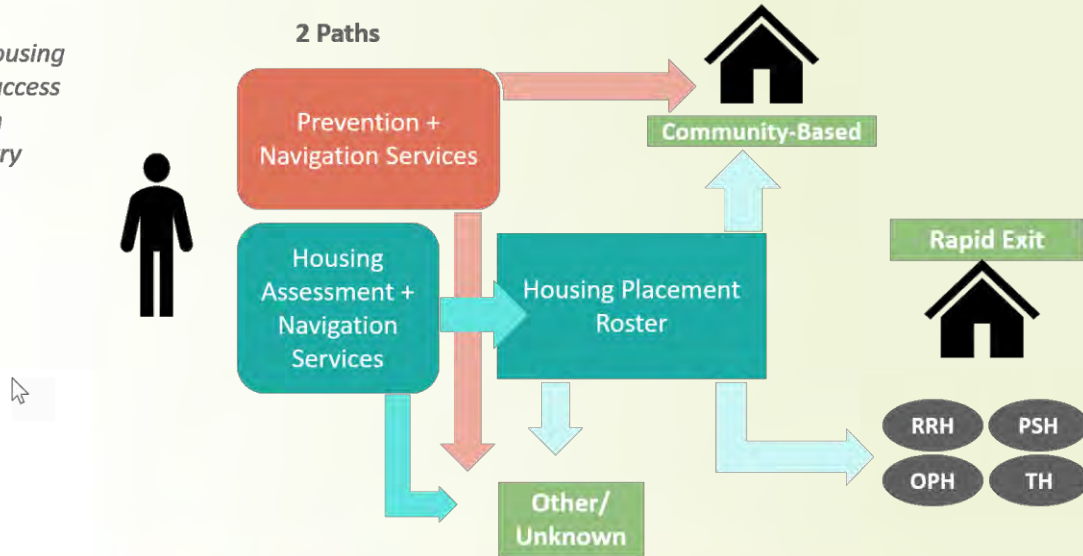


Humans process visual information  
**60,000** times faster than text.

# Not all data visualization is a dashboard

- Charts
- Infographics
- Reports

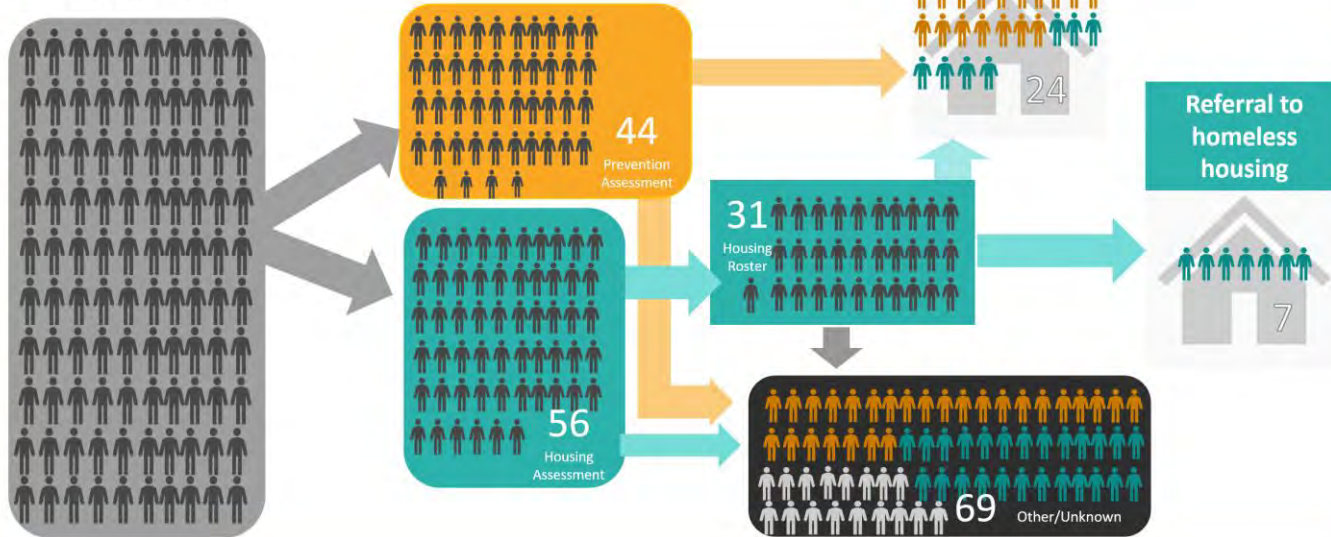
*When someone experiences a housing crisis, they can access services through Coordinated Entry*



# WHO IS GETTING HOUSED THROUGH CES?

If 100 people contacted CES...

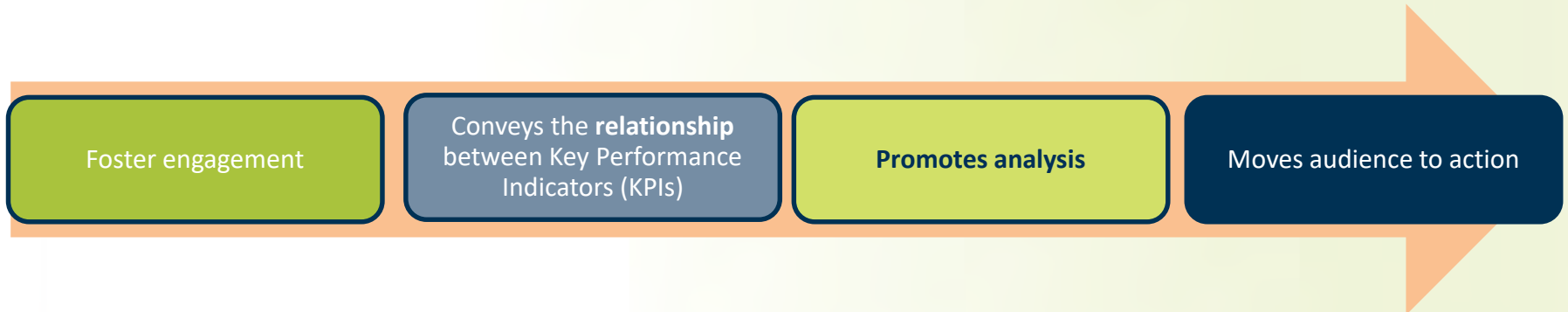
*current state*



# Dashboards facilitate clear take away messages...

...but allow the user to interact with the data.

These interactions:



# 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

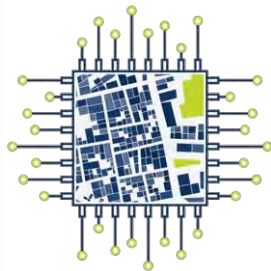


A word cloud of traits in various sizes and orientations. The words are: creative, reliable, passionate, tenacious, intelligent, savvy, witty, stubborn, analytical, thorough, engaging, talented, insightful, and kind. The words 'tenacious', 'intelligent', 'talented', and 'analytical' are the largest and most prominent.



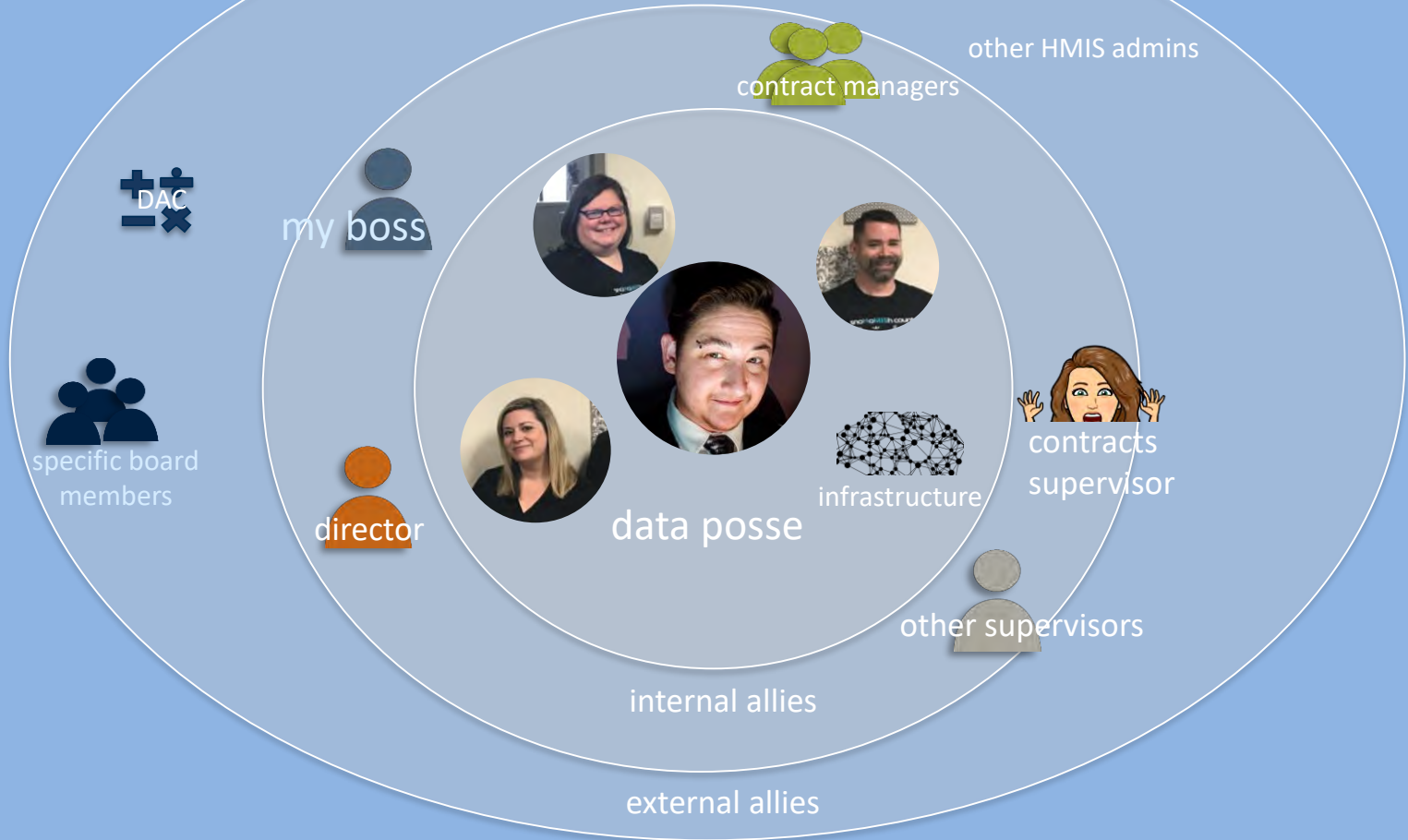


# Break Time



# Your Environment

# You can't do it alone

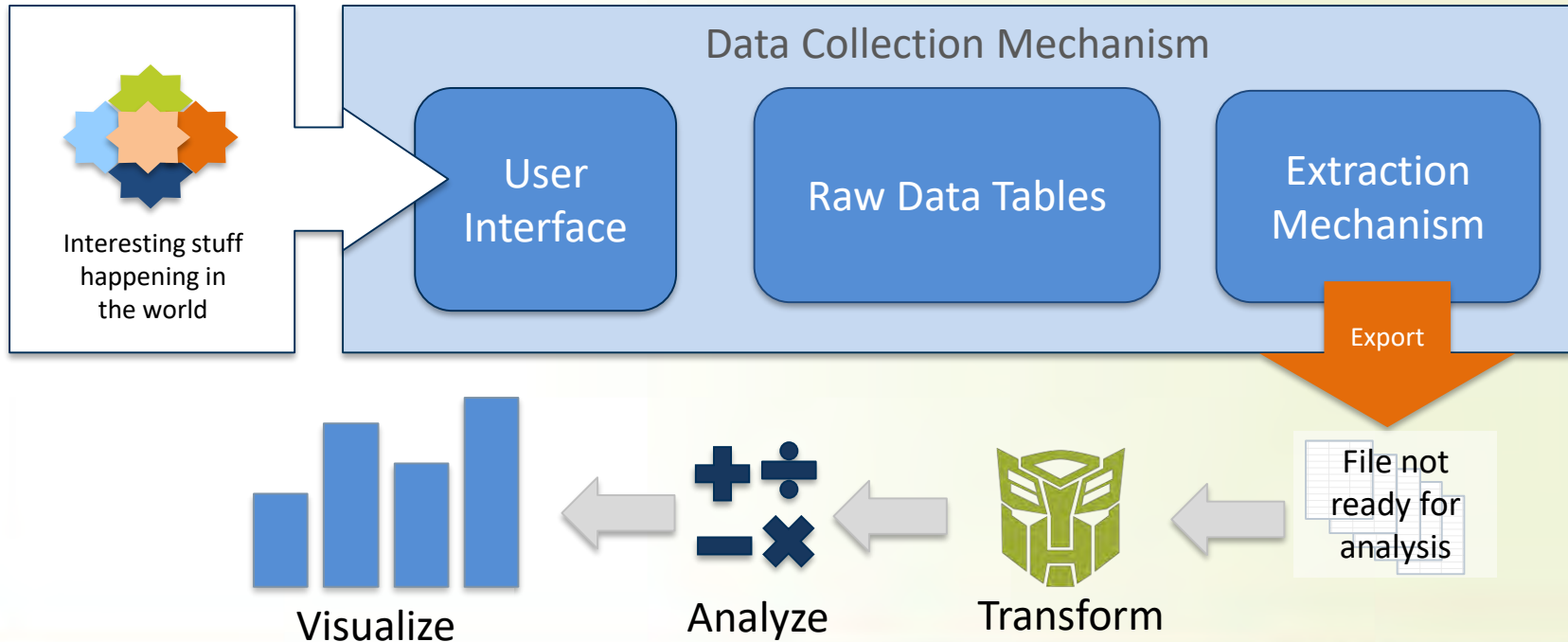




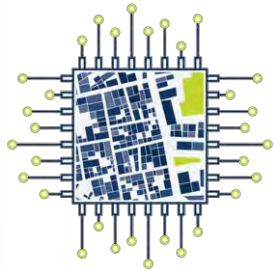
# Evolution of Data-Driven Culture

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

# Decision Points and Opportunities







# Practice Connecting to a Data Source

*page 6*



# Table Joins

Favorite Animal	Person
Unicorn	Jesse
Wolf	Kendall
Shark	Alex
Cat	Stephanie
Gecko	Jackie

Number of dogs	Number of cats	Horses	Person
1	0	0	Debbi
1	0	0	Jesse
2	0	1	Kendall
2	0	0	Alex
2	1	0	Stephanie

- Inner
- Left
- Right
- Full Outer


*Inner Join - Only matching values from Table 1 and 2*

Favorite Animal	Person	Number of dogs	Number of cats	Horses
Unicorn	Jesse	1	0	0
Wolf	Kendall	2	0	1
Shark	Alex	2	0	0
Cat	Stephanie	2	1	0

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

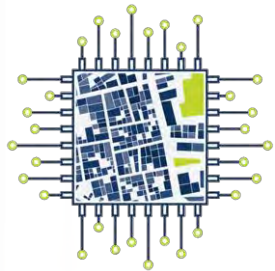
Favorite Animal	Person	Number of dogs	Number of cats	Horses
Unicorn	Jesse	1	0	0
Wolf	Kendall	2	0	1
Shark	Alex	2	0	0
Cat	Stephanie	2	1	0
Gecko	Jackie			
	Debbi	1	0	0

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

Favorite Animal	Person	Number of dogs	Number of cats	Horses
Unicorn	Jesse	1	0	0
Wolf	Kendall	2	0	1
Shark	Alex	2	0	0
Cat	Stephanie	2	1	0
Gecko	Jackie			

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

Favorite Animal	Person	Number of dogs	Number of cats	Horses
Unicorn	Jesse	1	0	0
Wolf	Kendall	2	0	1
Shark	Alex	2	0	0
Cat	Stephanie	2	1	0
	Debbi	1	0	0

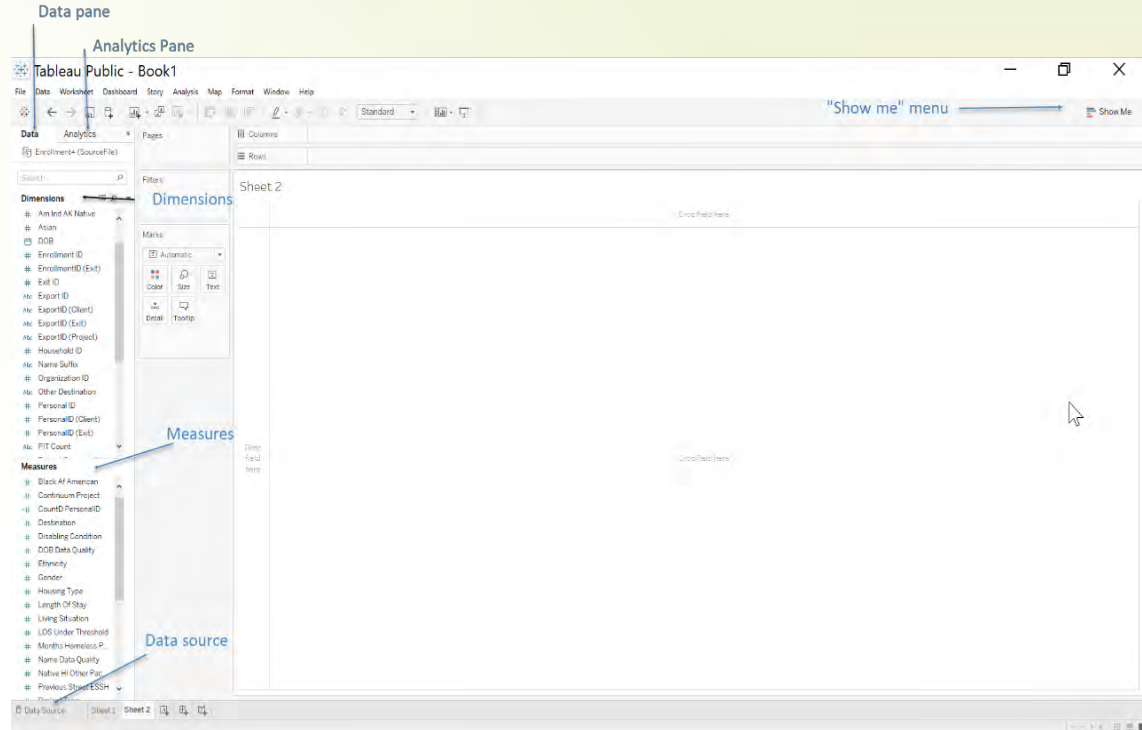


# Practice Joining Tables

*page 8*



# Getting to Know Tableau





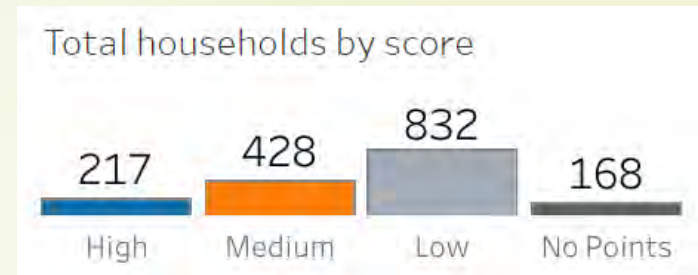
# Dimensions

## Discrete = Categorical, Countable

- Finite number of values
- Counted, not measured

### Examples:

- Age group at entry
- Favorite color



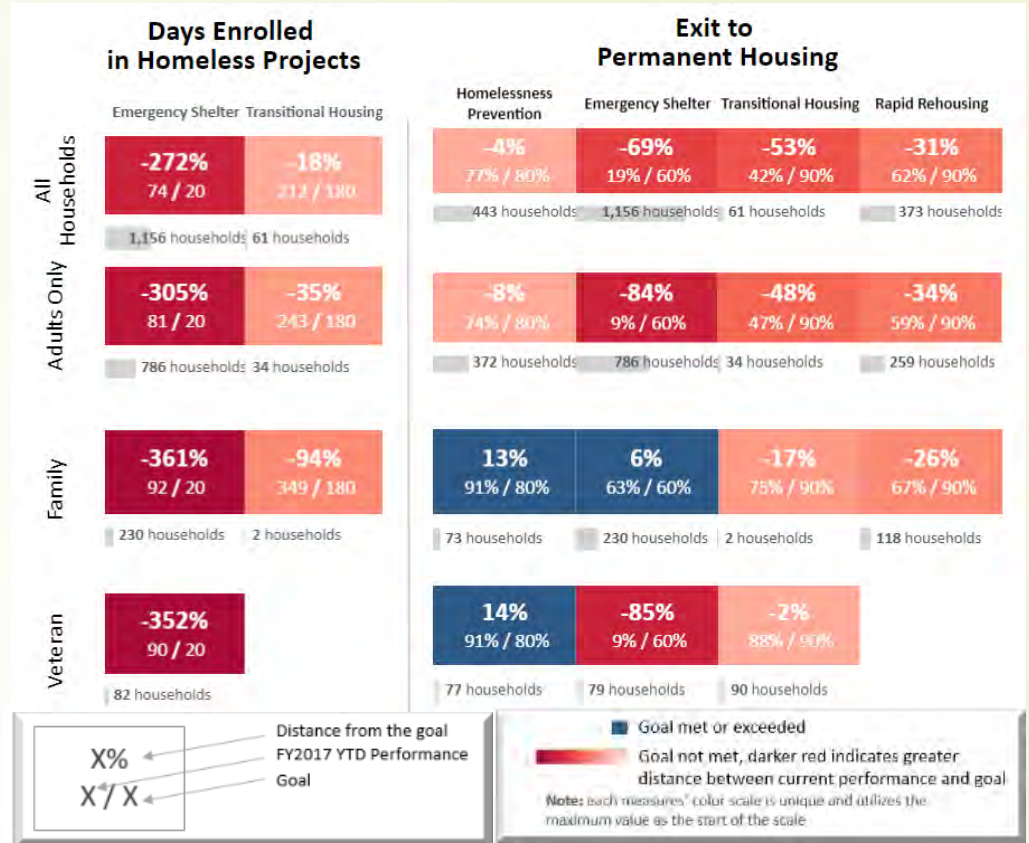


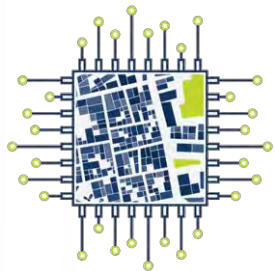
# Measures

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

Examples:

- Age
- Income
- Days in Program





## Practice – Altering Data Types

*page 9*

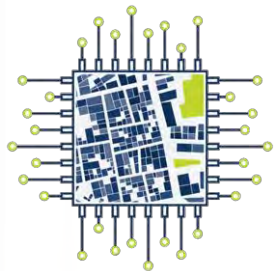




Measure  
to a  
Dimension

Converting  
Numeric Field  
to a  
String Field

Changing  
default  
formatting



## Practice – Organizing the Data Pane *page 10*

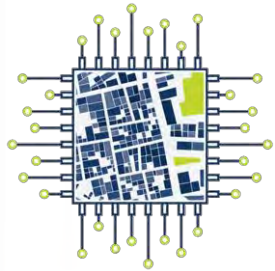
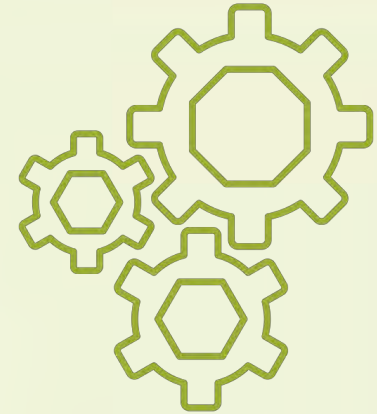
# Organizing your workbook

- 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”

The screenshot shows the Tableau Desktop interface. In the top left, a search box contains the text 'date'. Below it, the 'Dimensions' pane lists various date-related fields. A context menu is open over the search results, with 'Folders' selected and 'Create Folder...' visible. The interface also shows filters, marks, and a visualization area.



# Break Time

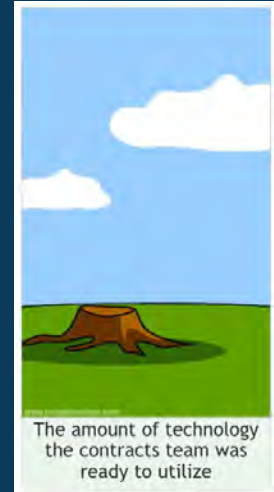
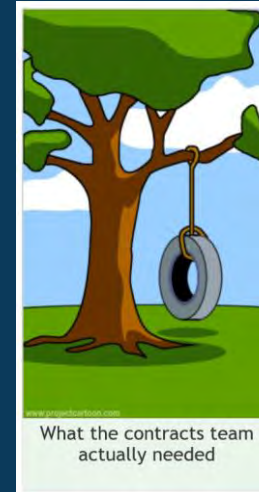
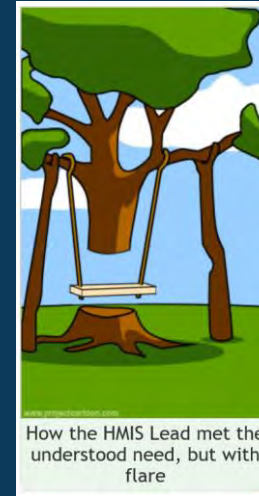
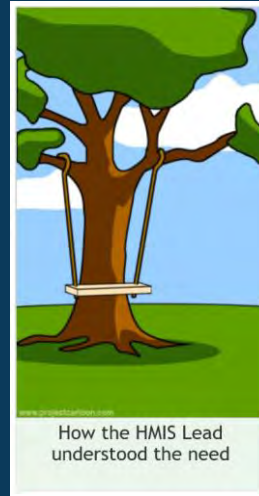


**Let's talk about data project planning**

## Data Visualization

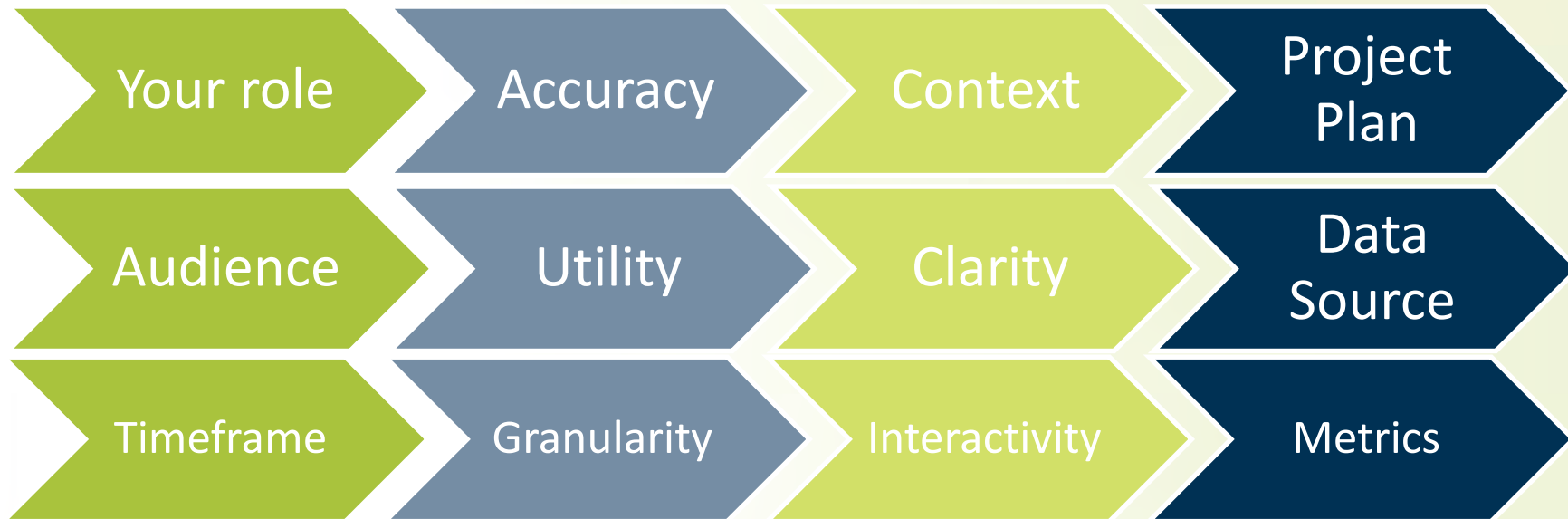
- Opportunity to practice...
  - communication skills
  - patience
  - iteration

Can you build us a swing?





## Project Planning Overview



^ What's wrong with this visualization?

# YOUR ROLE

Make the dashboard support your stakeholders' agenda

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.

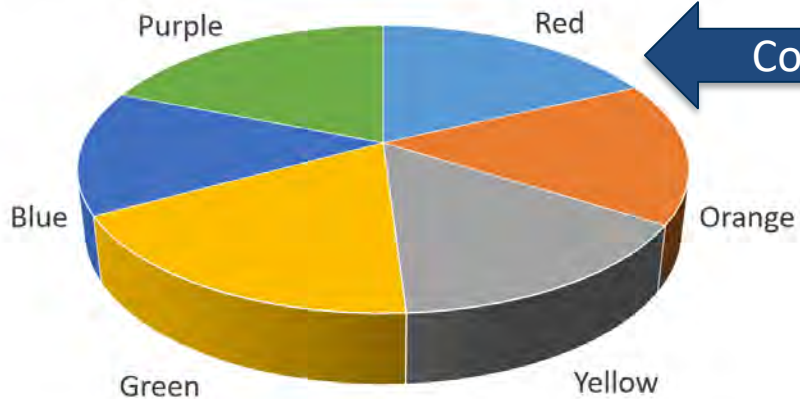
Leave the summary analysis entirely to the user





# Tell me about this chart

The most preferred color of people surveyed



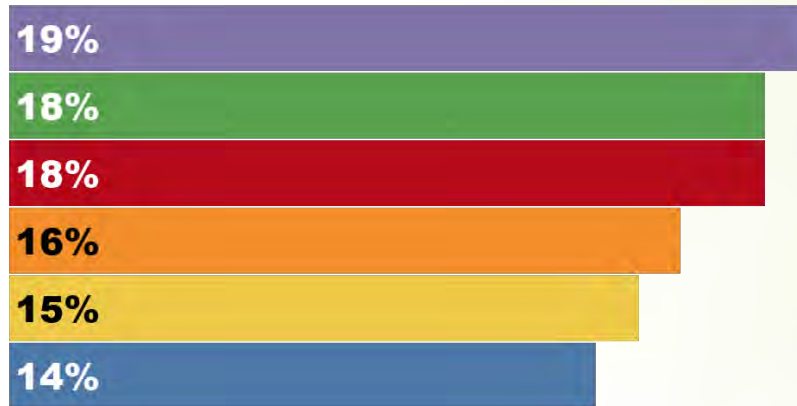
Get to the point

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?

Demo: Finding  
Policy Changes



# Data Visualization Project Plan Template

- Stephanie made you all a present. See Attachment A of your manual.
- PS Stephanie – I made some changes.

Attachment A

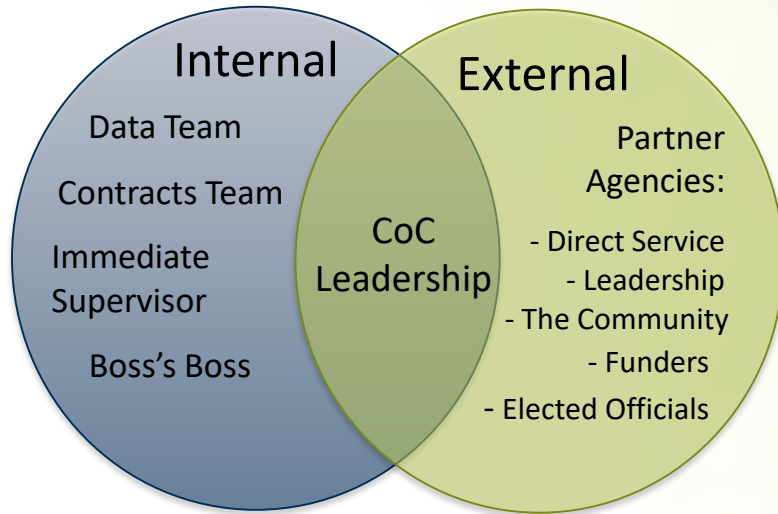
Sample Data Visualization Project Plan			
Project Contact:		Project Name:	
Analyst Staff:		Project Due Date:	
Component	Description	Notes	
Product Type <small>(dashboard, presentation, chart)</small>			
Media Type <small>(online static, online interactive, offline static)</small>			
Primary Audience			
Secondary Audience			
Primary Utility <small>(informational, exploratory, drive action)</small>			
Ongoing or single use		If ongoing, frequency:	Notes:
Factors to consider: How often will the product be used? How often is the data expected to change?			
Existing data source?		if yes, which? if no, will a data set be procured or pulled ad-hoc?	
Timeframe	__/__/__ to __/__/__	Time Grain	__ wkly __ mthly __ qtrly __ yrly __ CY __ FY __ PY __ Rolling
Metric 1		Notes:	
Grains	__ household __ person __ enrollment	__ entered __ active __ moved in __ exited	
Parameters/Filters	__ snapshot __ point in time __ trends __ adult/child __ adult only __ child only __ race __ ethnicity __ gender __ age group __ vet status __ AMI __ household type		
Other:			
Metric 1		Notes:	
Grains	__ household __ person __ enrollment	__ entered __ active __ exited	
Parameters/Filters	__ snapshot __ point in time __ trends __ adult/child __ adult only __ child only __ race __ ethnicity __ gender __ age group __ vet status __ AMI __ household type		
Other:			
Metric 2		Notes:	
Grains	__ household __ person __ enrollment	__ entered __ active __ exited	
Parameters/Filters	__ snapshot __ point in time __ trends __ adult/child __ adult only __ child only __ race __ ethnicity __ gender __ age group __ vet status __ AMI __ household type		
Other:			
Metric 3		Notes:	
Grains	__ household __ person __ enrollment	__ entered __ active __ exited	
Parameters/Filters	__ snapshot __ point in time __ trends __ adult/child __ adult only __ child only __ race __ ethnicity __ gender __ age group __ vet status __ AMI __ household type		
Other:			

## Planning

# 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
    - Example: <https://endhomelessness.org/homelessness-in-america/homelessness-statistics/state-of-homelessness-report/>
  - 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



## What do they do?

- Make decisions
- Provide services
- Monitor performance
- Understand need
- Get engaged

Time to generate and spend social capital

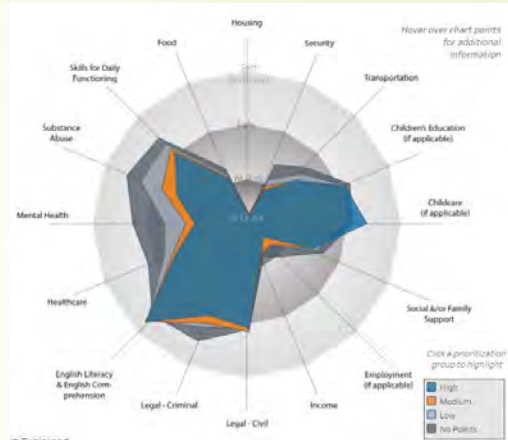
1. Connect
2. Identify shared values
3. Build on what they know



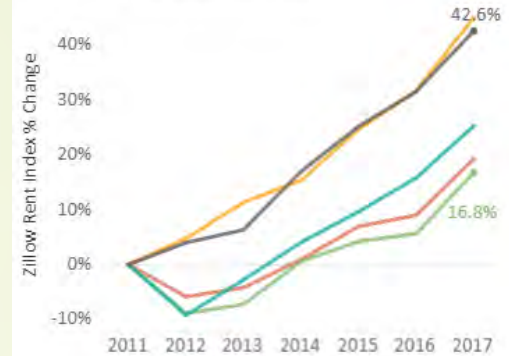
# Planning The Utility

## 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



Change in Rent Index  
5 Largest Cities in Snohomish County



Select the parameters below to control the focus of dashboards throughout the workbook.

Start Date:  End Date:

Organization Name:

Rapid Rehousing Type:

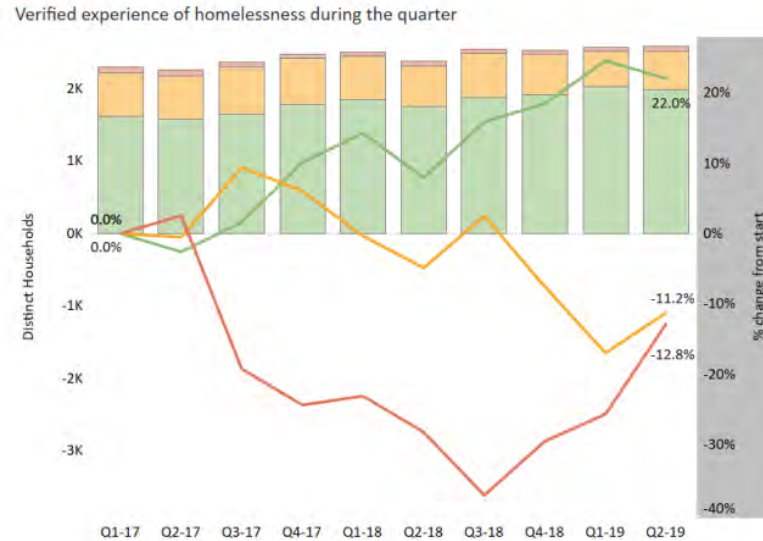
Household Type:



# Be Clear About the Problem

## WHO IS HOMELESSNESS INCREASING FOR?

Overall, the number of households experiencing homelessness was up almost 14% since Q1 of 2017



The number of households experiencing homeless has decreased for both **families** and **child-only** households.

But for **adult-only** households, there has been an increase of 22%

- Family
- Only Adults
- Only Minors



## 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

## 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

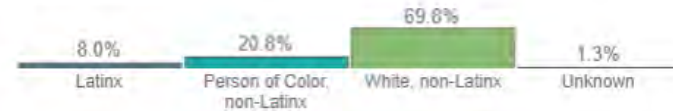
- Parameters
- Filters
- Actions

## Choose a demographic

Ethnicity & Race Group

Select a demographic to explore differences in composition and rate for all households who exited (outgoing) the system during the time period.

### Composition



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

## Choose a demographic

Ethnicity & Race Group

Select a demographic to explore differences in composition and rate for all households who exited (outgoing) the system during the time period.

## Composition



## Select a Subpopulation

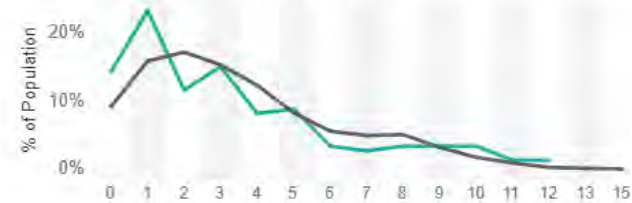
Latinx

Here we explore the overall distribution of scores. If the **blue line** is above the **gray line** it means more people in the subpopulation have that *particular* score than the overall population.

- Selected Subpopulation
- All Others

## Distribution of Vulnerability Score

Head of household only, entered during period



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.

## Increase your understanding

Choose a demographic

Latinx



## Planning Metrics

Get to know your neighbor

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

### Hypothesis

What do you think is likely to happen?

### Assess Options

Are you collecting data you can track to see if you are right?

### Narrow Options

Eliminate redundancy.

### Consider Other Factors

Is there a scenario where what I am measuring might indicate the hypothesis is not true, but it in fact is?



## 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.

n-2 PH Attained

Solution → IF [Demographic Parameter] = 'Any' then null else

```
COUNTD(IF ISNULL([Calc Demographics])
AND [Period - Exit] = TRUE
AND [Living Situation Category] = 'Homeless'
THEN [Enrollment ID]
ELSEIF ISNULL([Calc Demographics])
AND [Move In During Timeframe (LOD)] = TRUE
AND [Living Situation Category] = 'Homeless'
THEN [Enrollment ID] ELSE null END)

END
```

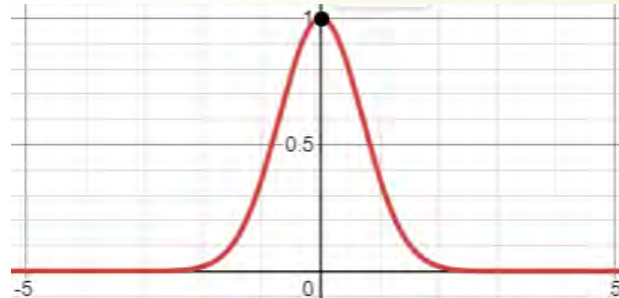
# Z-score, what does this deviant mean?

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.





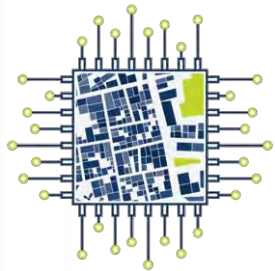
# 95% Confidence Interval

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!!!



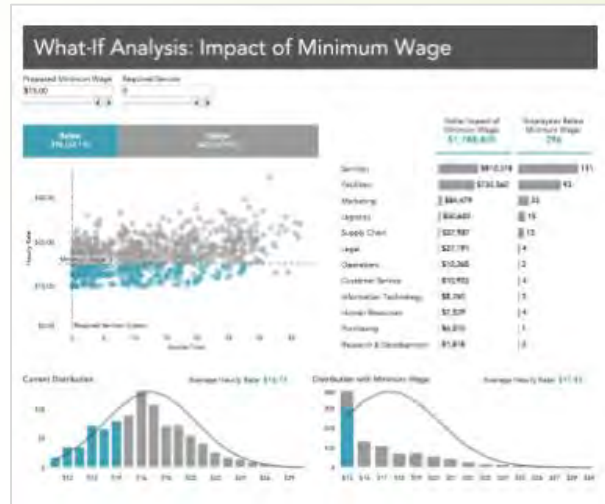
**That was exhausting – Break Time**



Design

# The Layout: Resources

- [Tableau Data Dashboard Webinar](#)
- [The Big Book of Dashboards](#)
- [The Data Visualization Checklist](#)



In short:

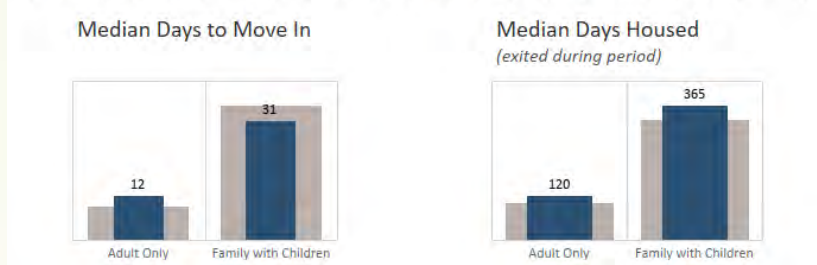
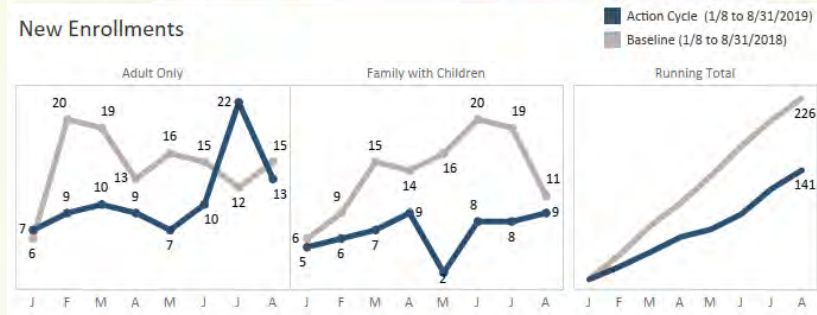
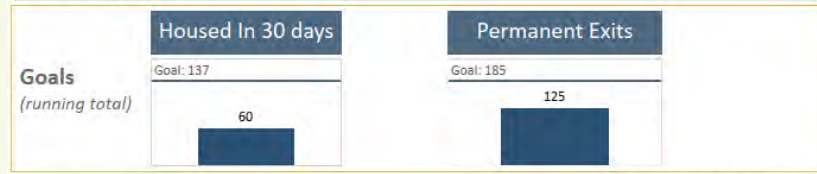
- Don't make it weird
- People view a dashboard like they read a book
  - Left to right
  - Top to bottom
- Leverage BANs for impact



# Using color with consistent meaning

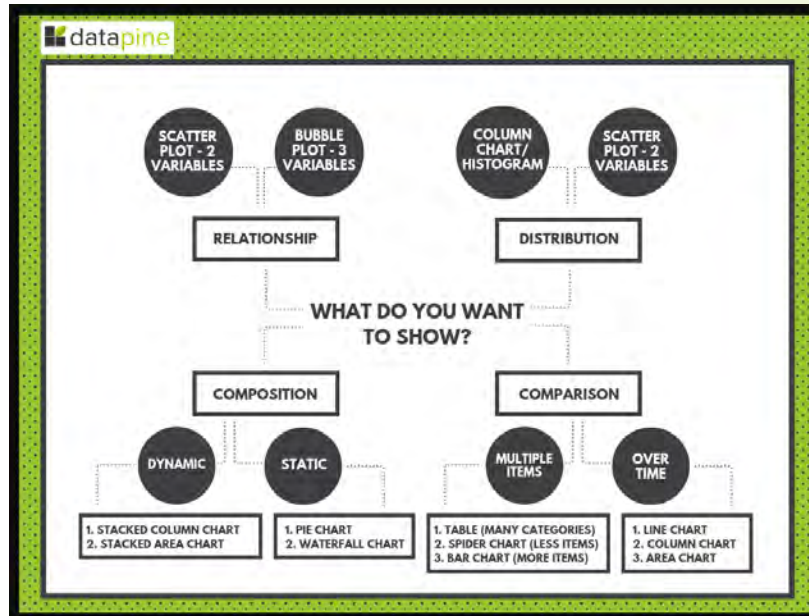
It's kind of a funny story...

## Rapid Rehousing Initiative Dashboard As of 8/31/2019





# Four types of <sup>DATA</sup> relationships



<https://www.datapine.com/blog/dashboard-design-principles-and-best-practices/>





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](https://public.tableau.com/gallery))
- By yourself, or with a partner, find a viz
- Critique the viz using the tool (Data Viz Checklist)

View Complete Tool:

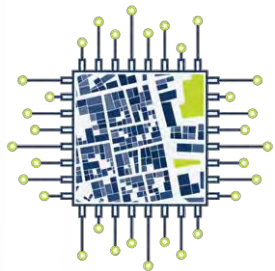
[stephanieevergreen.com/updated-data-visualization-checklist](https://stephanieevergreen.com/updated-data-visualization-checklist)



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

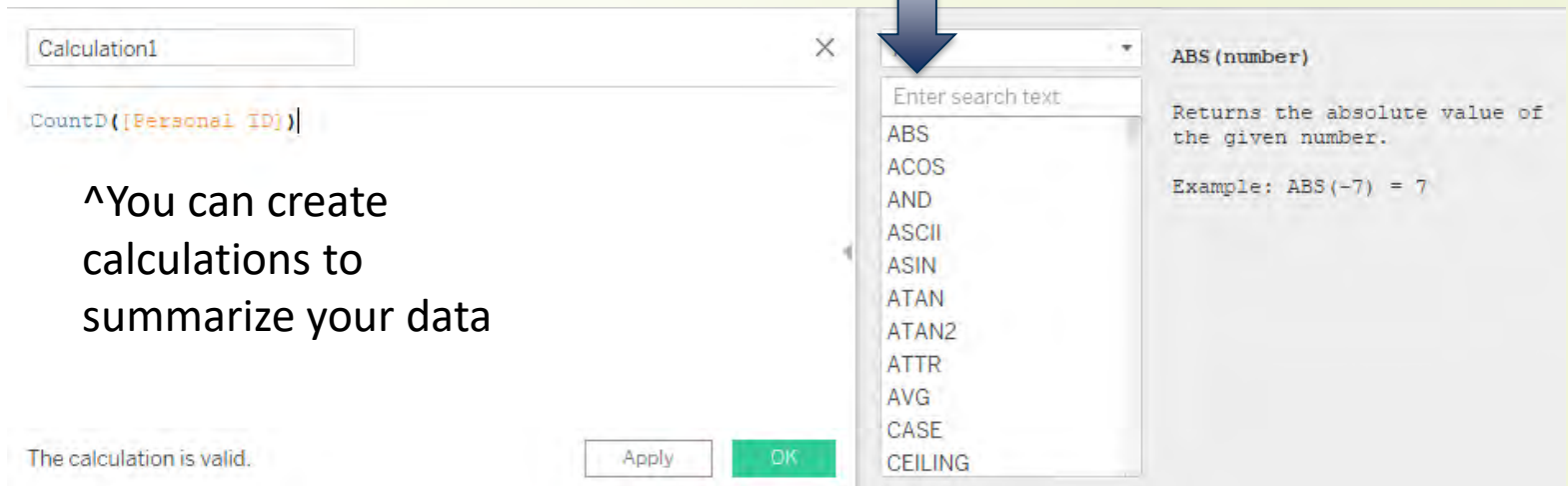


## Practice – Calculated Fields

*page 10*

# Calculated Fields

You can search for functions



The screenshot shows a calculation editor window titled "Calculation1". The main text area contains the formula `CountD([Personal ID])`. Below the text area, a message states "The calculation is valid." At the bottom, there are "Apply" and "OK" buttons. On the right side, a search dropdown menu is open, displaying a list of functions: ABS, ACOS, AND, ASCII, ASIN, ATAN, ATAN2, ATTR, AVG, CASE, and CEILING. A blue arrow points to the search input field. To the right of the dropdown, a tooltip for the "ABS" function is visible, showing the syntax "ABS (number)", the description "Returns the absolute value of the given number.", and an example "Example: ABS (-7) = 7".

^You can create calculations to summarize your data



# Other Examples of Calculated Fields

Start Date HARDCODE

```
DATE ('10/1/2010')
```

Exit During Timeperiod

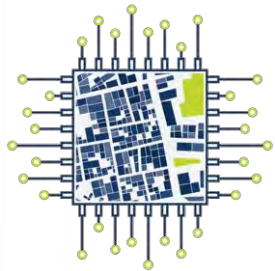
```
[Exit Date] >= [Start Date HARDCODE]  
and [Exit Date] <= [End Date HARDCODE]
```

LOD Exit Income

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

Change in Entry/Exit Income

```
IF [Period - Exited] = TRUE  
  THEN [LOD Exit Income] - [LOD Entry Income]  
  ELSE NULL END
```

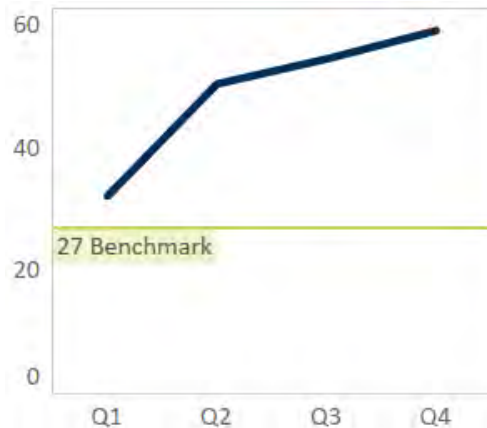


## Practice – Formatting *page 12*

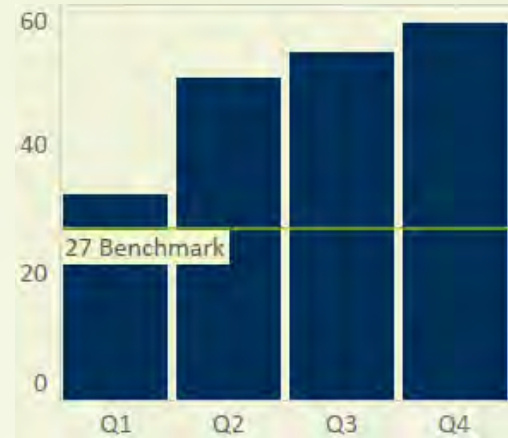


# Same Data, Different Approach

*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.

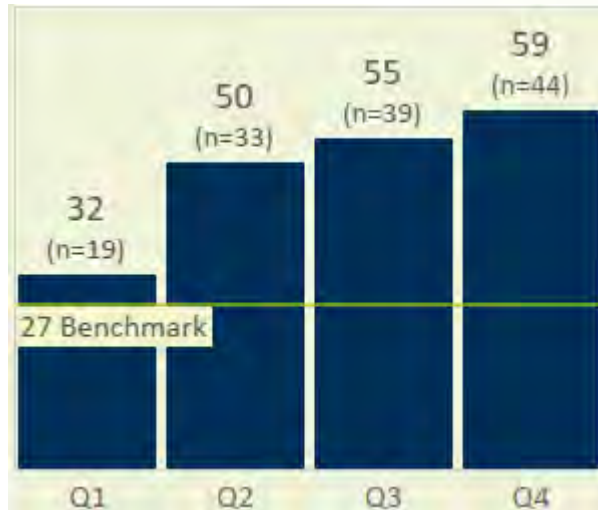


Tip: Aim for a 45° angle from the lower left corner to the upper right



# 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*?



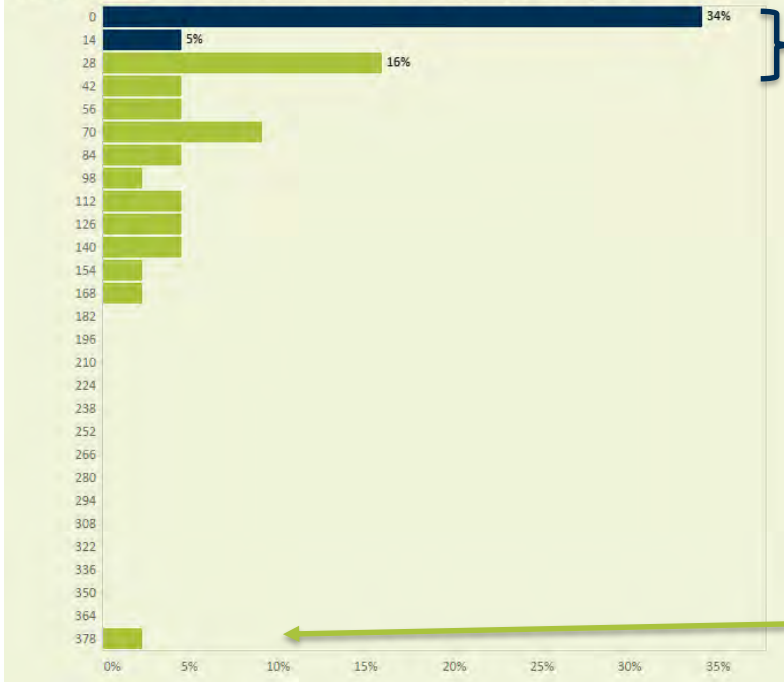




# Bins/Histograms

Distribution - Days to Move In

*Displays only data for move-in dates which occurred since the beginning of the program year.*



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

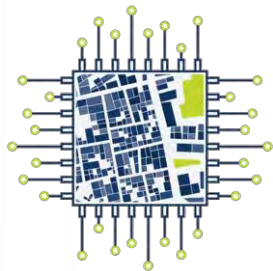
% **Goal Met** vs **Not Met**

*Displays only data for move-in dates which occurred since the beginning of the program year.*



Average: 59

Median: 36



## Practice – Getting to Know Your Data Set

*page 13*



# Getting to know your data

- Number of Records
  - HouseholdID
  - PersonID
  - 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  
45% of people exited to other  
102%

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

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

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

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