



MedStar Health

It's how we **treat people.**

May 21, 2021

MHRI-GHUCCTS Monthly Statistical Seminar Series 2020-2021

The Tableau Basics: How to Visualize COVID-19 Surveillance Data

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MedStar Health National Center for Human Factors in Healthcare

Agenda

1. Introduction
2. Goals of this presentation
3. What is data visualization?
4. Cognitive science and data visualization
5. Approaching visualization
6. Tableau Walkthrough
7. Resources
8. Questions



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- Graduated from Georgetown University majoring in Biology of Global Health
- Started working at MedStar Health National Center for Human Factors in Healthcare in Aug. 2018
- Play ultimate frisbee in my free time
- Fun fact: have appeared on ESPN SportsCenter's Top 10 Plays twice for two different sports



Christian Boxley

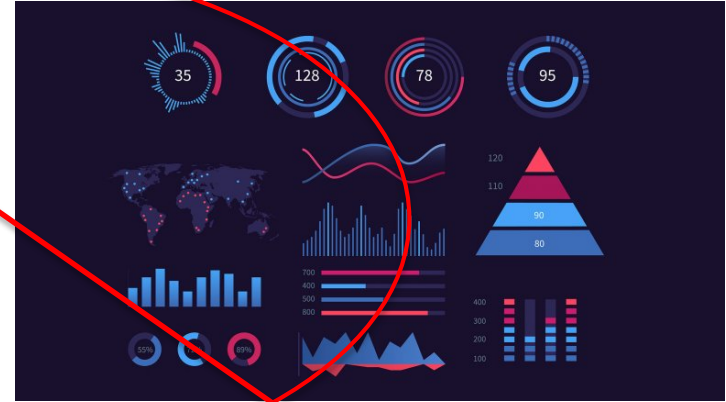
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Goals

- Not possible to teach everything there is to know about data visualization and Tableau in one hour
- I'm not an expert myself!



Goals

We hope to give you all the building blocks to:

- Start asking good questions about data viz
- Think critically about data viz
- Create your own visualizations



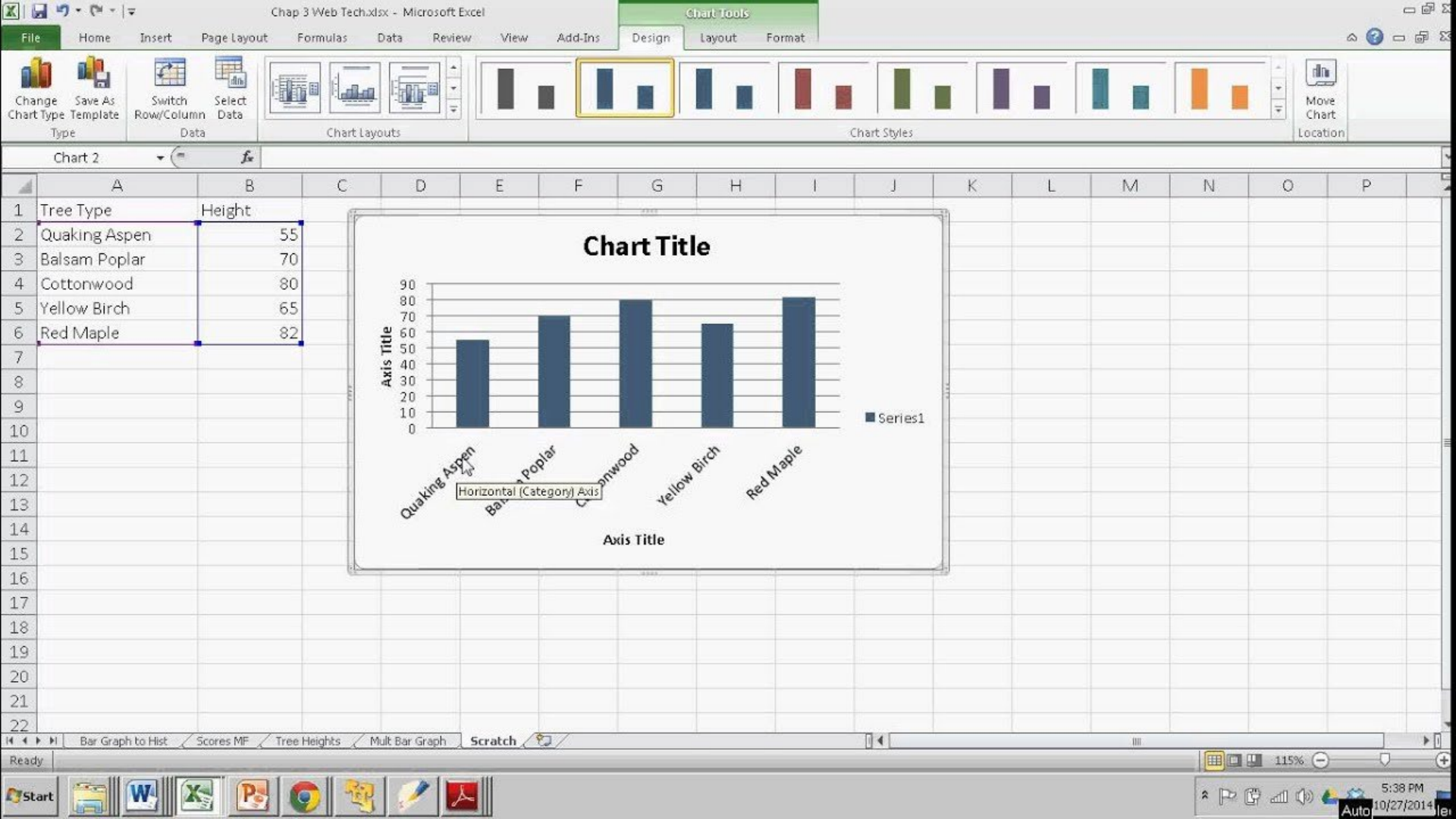
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**What do you think when you hear *data
visualization*?**





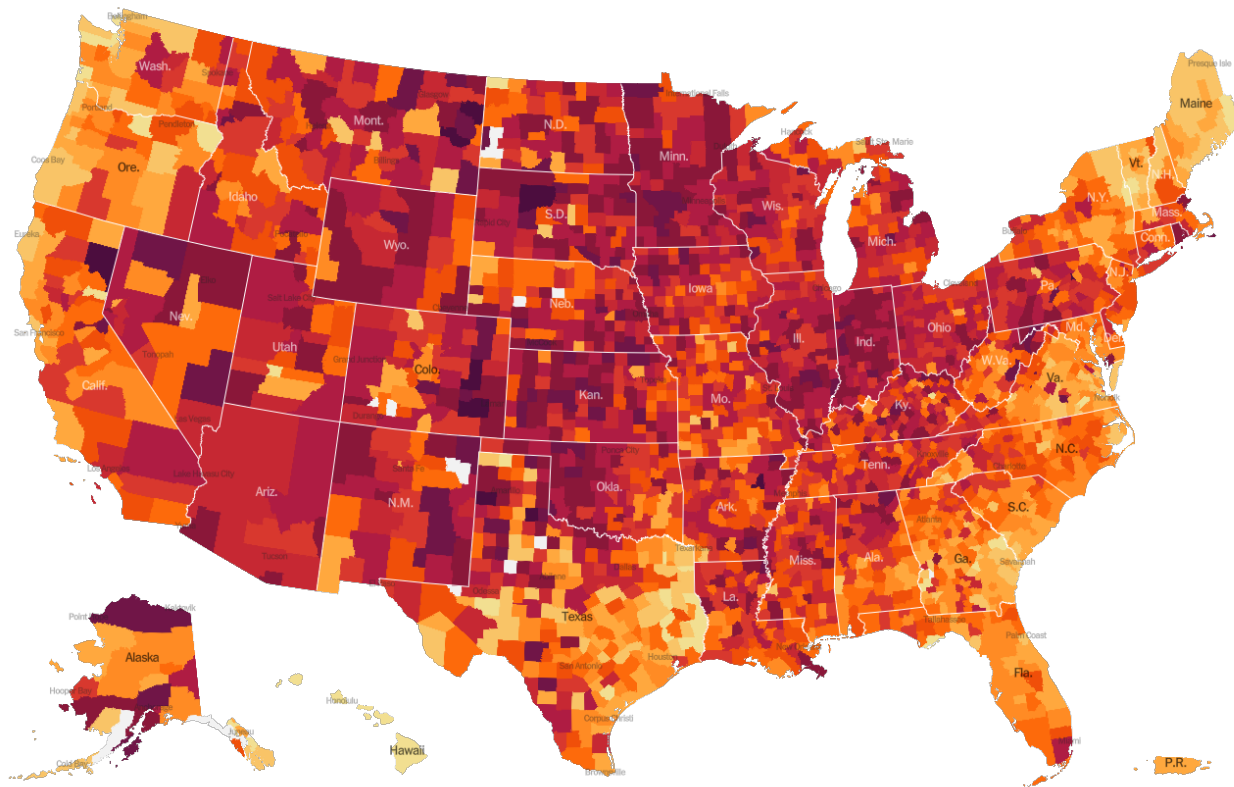
Data visualization is everywhere

Favorite Pets		
Pet	Tally Marks	Number
		10
		4
		6









NYTimes COVID-19 Tracker (on December 7th, 2020)



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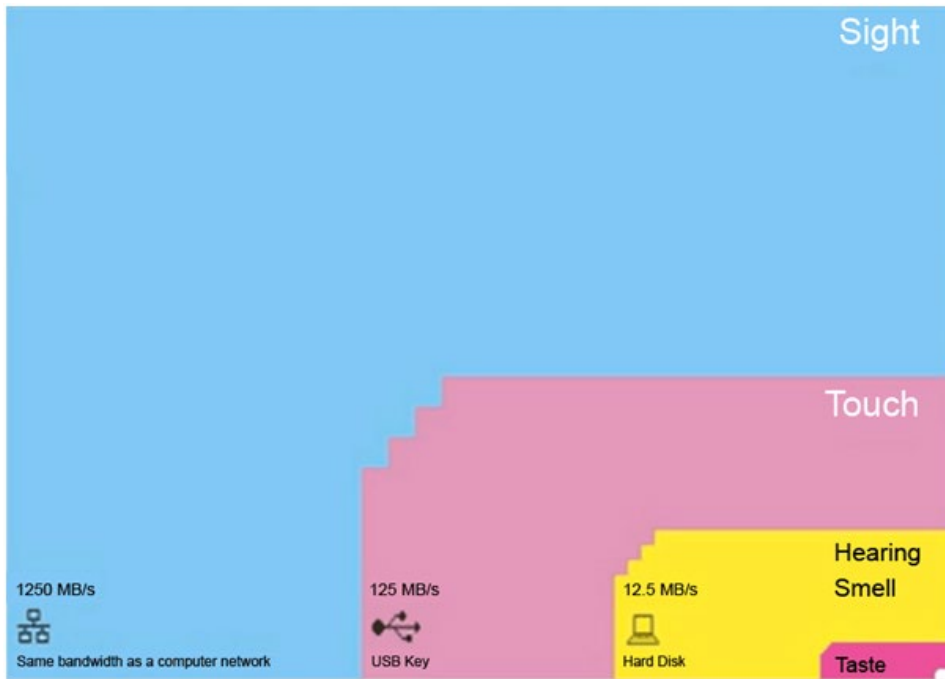
Humans are Visually-Driven Creatures



Humans are Visually-Driven Creatures



Strengths of Human Vision


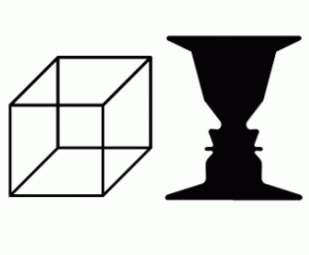
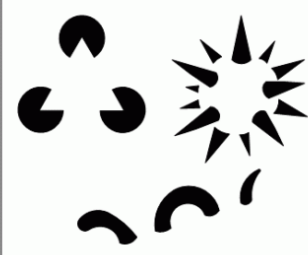
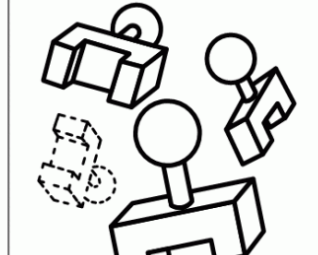
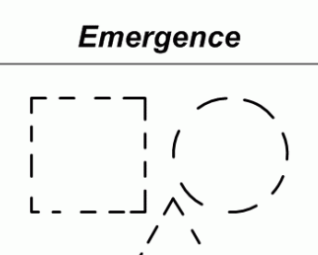
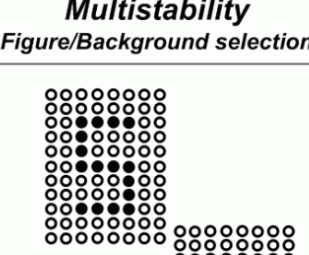
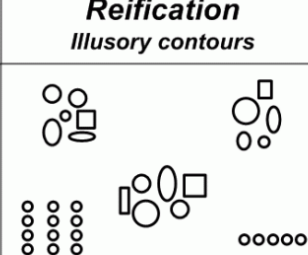
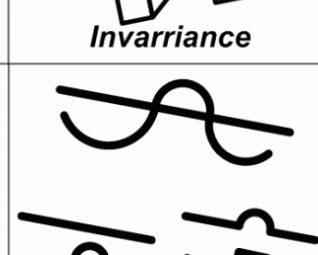


High Bandwidth



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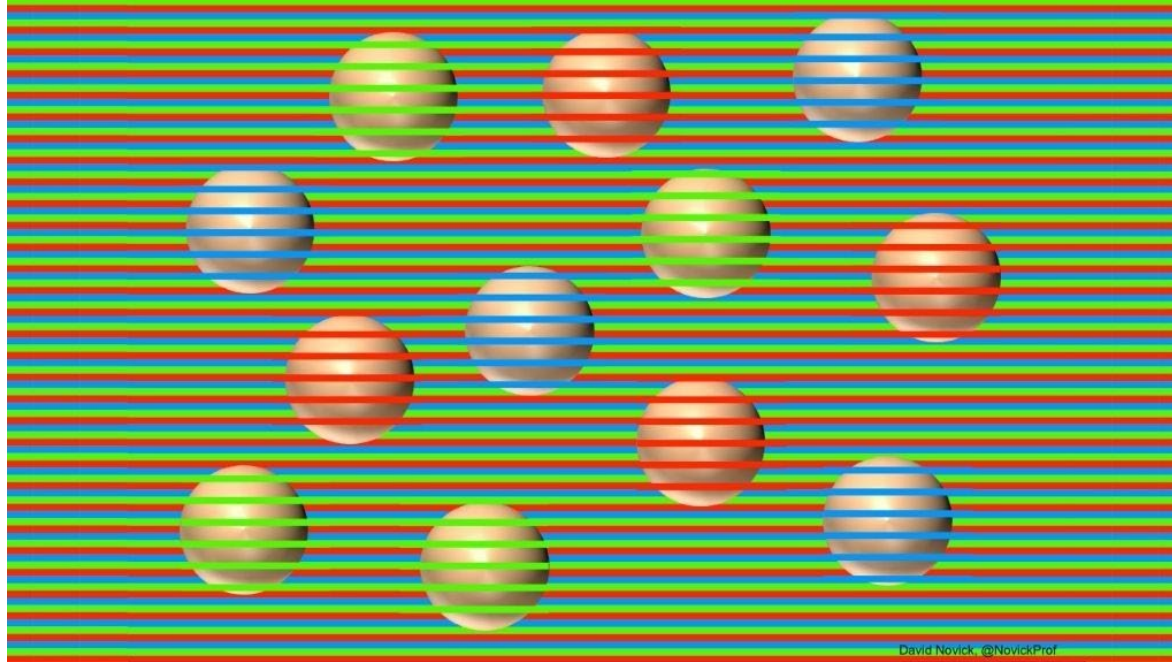
Strengths of Human Vision

 <p>Emergence</p>	 <p>Multistability <i>Figure/Background selection</i></p>	 <p>Reification <i>Illusory contours</i></p>	 <p>Invariance</p>
 <p>Closure</p>	 <p>Similarity</p>	 <p>Proximity</p>	 <p>Continuity <i>We see this...but not this</i></p>

“Fill in the blank”: Gestalt Pattern Recognition



Weaknesses of Human Vision



Optical Illusions - Perceptual Biases

Weaknesses of Human Vision



RESEARCH, ROGER DEET Age: 26 years DOB: 06/18/1990 MRN: 281002003297 Patient Portal: No Allergies: No Known Medication
Pref Lang: Fin#: 381002003559 Type: Emergency (02/22/2017 14:48 - No - Discharge date-) Loc: CED; MAIN Weight: 70 KG on 02/27/17 12:3

Gender: Male

Diagnoses & Problems

Diagnosis (Problem) being Addressed this Visit

Search: Tylenol 550 Contains Advanced Options Type: Discharge Meds as Rx

Search within: All

Child Tylenol Cold Multi-Symptom Plus Cough oral ta...
Childrens Tylenol Allergy-D oral liquid
Childrens Tylenol Cold Multi-Symptom oral tablet, che...
Childrens Tylenol Cold oral liquid
Childrens Tylenol Cold Plus Cough oral liquid
Childrens Tylenol Flu oral liquid
Tylenol 325 mg oral capsule
Tylenol 325 mg oral tablet
Tylenol 8 Hour Caplet 650 mg oral tablet, extended rele...
Tylenol 8 HR Arthritis Pain 650 mg oral tablet, extended...
Tylenol Allergy Complete NightTime oral tablet
Tylenol Allergy Multi-Symptom Nighttime oral tablet
Tylenol Allergy Multi-Symptom oral tablet
Tylenol Allergy Sinus Caplet oral tablet
Tylenol Allergy Sinus Gelcap oral tablet
Tylenol Allergy Sinus Geltab oral tablet
Tylenol Allergy Sinus NightTime oral tablet
Tylenol Arthritis Caplet 650 mg oral tablet, extended rel...
Tylenol Caplet 325 mg oral tablet
Tylenol Caplet 500 mg oral tablet
Tylenol Children's Multi-Symptom Cold Plus oral susp...
Tylenol Children's Plus Cold & Cough oral suspension
Tylenol Children's Plus Cold oral liquid
Tylenol Childrens 160 mg/5 mL oral suspension
Tylenol Childrens Plus Cough & Runny Nose oral susp...
Tylenol Cold & Cough Nighttime Cool Burst oral liquid
Tylenol Cold & Flu Severe Day Time oral liquid
Tylenol Cold & Flu Severe oral liquid
Tylenol Cold & Flu Severe oral tablet
Tylenol Cold Complete Formula oral tablet
Tylenol Cold Day/Night Convenience Pack oral kit
Tylenol Cold Head Congestion Day and Night oral tablet
Tylenol Cold Head Congestion Nighttime Cool Burst or...
Tylenol Cold Head Congestion oral tablet
Tylenol Cold Head Congestion Severe oral tablet
Tylenol Cold Max Day oral tablet
Tylenol Cold Multi-Symptom Daytime oral liquid
Tylenol Cold Multi-Symptom Daytime oral syrup
Tylenol Cold Multi-Symptom Daytime oral tablet
Tylenol Cold Multi-Symptom Nighttime Cool Burst ora...
Tylenol Cold Multi-Symptom Nighttime oral liquid
Tylenol Cold Multi-Symptom Nighttime Rapid Release ...
Tylenol Cold Multi-Symptom Rapid Release Day Night ...

Tylenol Cold Multi-Symptom Severe 325 mg-10 mg-20...
Tylenol Cold Multi-Symptom Severe Daytime oral liquid
Tylenol Cold Multi-Symptom Severe oral tablet
Tylenol Cold Non-Drowsy Caplets oral liquid
Tylenol Cold Non-Drowsy Gelcaps oral tablet
Tylenol Cold Relief Caplet 500 mg-12.5 mg oral tablet
Tylenol Cold Relief Nighttime 1000 mg-50 mg/30 mL o...
Tylenol Cold Relief Nighttime 500 mg-25 mg oral tablet
Tylenol Cold Relief Nighttime Caplet 500 mg-25 mg or...
Tylenol Cold Severe Congestion Non-Drowsy oral tablet
Tylenol Cold Sore Throat Extra Strength 500 mg/15 mL ...
Tylenol Cough & Sore Throat Night Time oral liquid
Tylenol Extended Release 650 mg oral tablet, extended ...
Tylenol Extra Strength 500 mg oral tablet
Tylenol Extra Strength PM 500 mg-25 mg oral tablet
Tylenol Extra Strength PM Rapid Release Gelcaps 500 m...
Tylenol Flu Day/Night Convenience Pack oral kit
Tylenol Flu Maximum Strength oral tablet
Tylenol Flu Night Time oral liquid
Tylenol Gelcap Extra Strength 500 mg oral tablet
Tylenol Infant's 160 mg/5 mL oral suspension
Tylenol Infants Cold Plus Cough oral syrup
Tylenol Nighttime Flu Gelcap Maximum Strength oral L...
Tylenol PM 1000 mg-50 mg/30 mL oral liquid
Tylenol Severe Cold & Flu Night Time oral liquid
Tylenol Simply Cough 5 mg/5 mL oral solution
Tylenol Simply Stuffy 15 mg/5 mL oral liquid
Tylenol Sinus - Headache Day 325 mg-5 mg oral tablet
Tylenol Sinus Congestion & Pain Severe oral tablet
Tylenol Sinus Congestion & Pain Severe oral tablet
Tylenol Sinus Congestion and Pain 325 mg-5 mg oral L...
Tylenol Sinus Congestion and Pain Cool Burst Day Nig...
Tylenol Sinus Congestion Nighttime oral tablet
Tylenol Sinus Day/Night Convenience Pack oral kit
Tylenol Sinus Night Time oral tablet
Tylenol Sinus Severe Congestion oral tablet
Tylenol Sore Throat Nighttime 1000 mg-50 mg/30 mL ...
Tylenol Warming Cold Multi-Symptom Nighttime oral ...
Tylenol Warming Cough & Sore Throat Nighttime oral ...
Tylenol with Codeine #2 oral tablet
Tylenol with Codeine #3 oral tablet

Tylenol with Codeine #4 oral tab
Tylenol with Codeine 120 mg-12
Tylenol Womens Menstrual Reli

Problems

Display: All

Display: All

Constitution CB6BBEA-E4

RESEARCH, ROGER DEET - 281002003297



Visual Noise and Overload



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Information Visualization

- Use understanding of perceptual system...
 - High bandwidth, holistic, pattern recognition
- To design accurate representations of data...
 - Reduce impact of perceptual biases, change blindness, visual noise
- That support human activities
 - Exploration, insight, and communication



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Explore your data

...only using this table

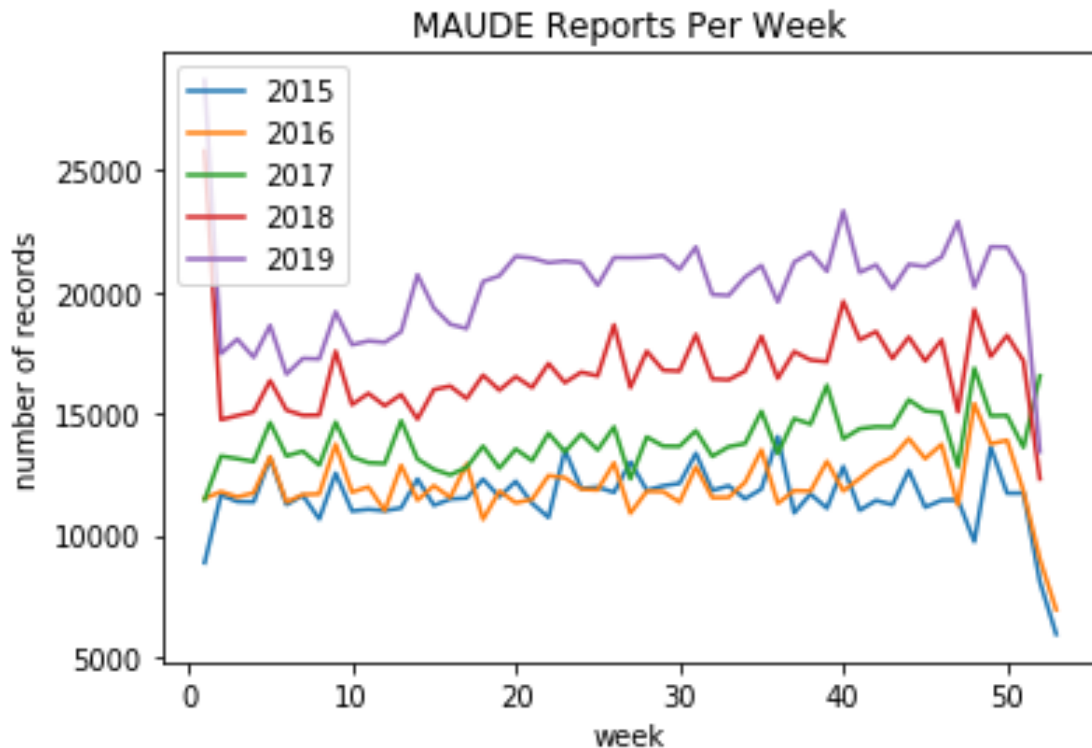
maude_df - DataFrame

Index	ate_of_event	date_report	ate_receive	ate_of_man	event_type	brt_to_man	event_location	brand_name	generic_name	ed_text	nn_text_type_cod	mn_mdr_text_key	patient_sequence
0	20180508	20181024	20180604		Injury		I	['WIRE BOLT ...	['APPLIANCE,...	/// A PATIE...	Manufacturer...	/// 110031864	/// 1
1	20180314	20180524	20180418	20160806	Injury		I	['PRECISION MONTAGE MRI']	['SPINAL CORD STIMULATOR']	/// A REPOR...	Manufacturer...	/// 1092710...	/// 1 /// 1
2	20180730	20180926	20180911	20130719	Injury		I	['PROTECTA XT CRT-D']	['DEFIBRILLA...	/// IT WAS ...	Manufacturer...	/// 1217660...	/// 1 /// 1
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Format Resize Background color Column min/max Save and Close Close



Explore your data



Explore your data

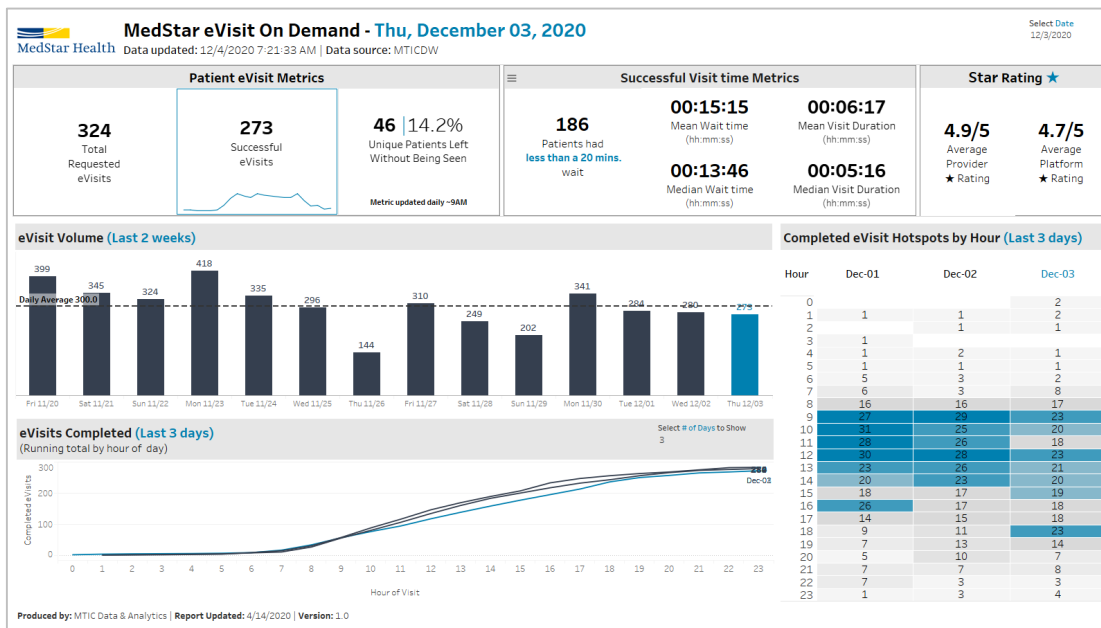
- Audience varies
- High level of interaction
- Used to gain insights
- Visualization structure constantly evolving



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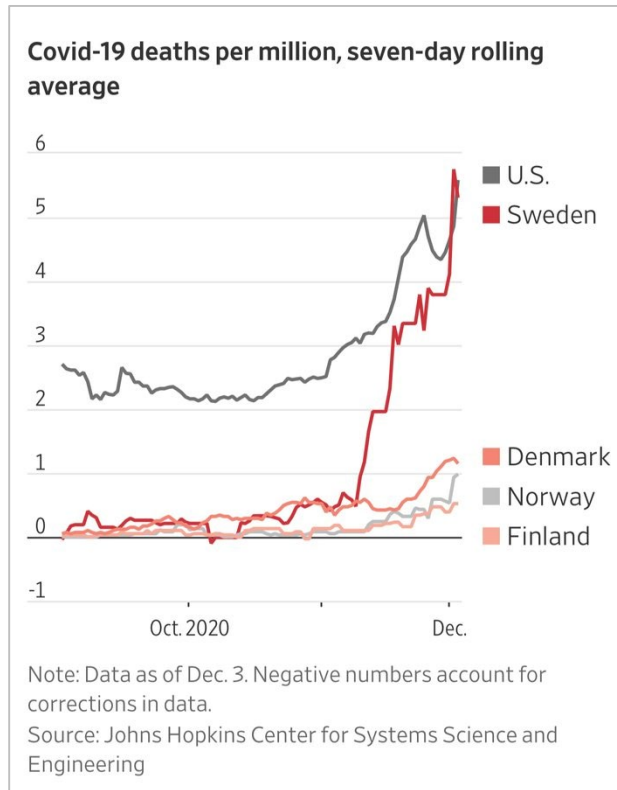
Drive operational decisions

- Known audience ideally with communication between developers and users
- Varying levels of interaction
- Data updated every morning
- Visualization structure has stayed consistent over 5+ months



Communicate your insights

- Typically, general audience
- Low levels of interaction
- Highly glanceable and intuitive



Questions to ask yourself.

- What are you trying to highlight and how does this fit into the bigger picture?
- The strengths and weaknesses of any chart, presentation, and the data (i.e. What does it show? What does it hide?)
- Who is your audience and what is the purpose of the visualization?



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What is + a b l e a u[®] ?

- An American interactive data visualization software company founded by three researchers at the Department of Computer Science at Stanford University in 2003
- In 2019, the company was acquired by Salesforce for \$15.7 billion
- Queries relational databases, cloud databases, spreadsheets, and more to generate graph-type data visualizations



Tips and Tricks

Tips and Tricks

- Speak your users' language – details matter
- Get feedback early and often

Guiding Questions

- **Exploration:** What questions do you want to answer?
- **Operational:** What task or decision is your user trying to make?
- **Communication:** What is the message you are trying to get across?



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Resources

- [Visualization Leaders and Thoughts for Beginners](#)
- Sign up for a [free trial](#) of Tableau
- [Recent paper](#) on rapidly developing visualizations and dashboards

Tableau is well-supported, and there is a [community](#) of users happy to help new users.



Thank you

Christian.L.Boxley@Medstar.net

It's how we treat people.



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