



# Data Journalism Playbook

With insight from the KING 5  
Data Journalism Pilot

# Contents

Foreword by Steve Doig 3

Intent of this playbook and story results from the pilot 4

Data journalism as a repeatable process 6

Technology to enable the process 9

Idea and hypothesis generation 10

Data gathering 14

Data cleaning 17

Importing and modeling 20

Data exploration 25

Storyboard and data visualization 28

Data visualization refinement 34

Publishing and sharing 40

Appendix 42

## Foreword

When newsrooms began to discover the power of data journalism more than 50 years ago, finding stories in data required then-rare skills of programming mainframe computers and training in social science techniques like statistical analysis. Today, thanks to the development of powerful desktop computers and versatile software tools like Microsoft Power BI, good data journalism work is within reach of almost any newsroom — even yours.

This playbook is proof of that concept. Television newsrooms, with their limited staffing and tight time constraints, have been slower over the years than their print counterparts to adopt the tools of data journalism. However, forward-thinking station managers are realizing they need these skills in-house, but the supply of data-savvy video journalists and news technicians is limited. This pilot project by Seattle’s KING 5 reporters is an effort to meet that demand. Working with Microsoft’s Power BI team, they developed a repeatable process for generating ideas for data stories, acquiring the raw data, cleaning it, finding the interesting patterns in it, and then creating the graphics that would help tell the story to station viewers and website users.

Data journalism adds the weight of evidence, not just anecdote, to make stories. As this playbook lays out, the team discovered that even with great software tools, data journalism does not mean that a few taps on a computer keyboard will make good stories magically appear on television screens. Smart analysis often is just the first step of telling a powerful data story, which also requires the traditional skills of developing sources, reading documents, interviewing those affected, confronting those responsible, and then integrating everything into a compelling visual package.

Power BI brings to data journalism an A-To-Z set of analysis and graphics functions that can help with every phase of working with data. However, one lesson from this pilot project is that learning to use all that power can be overwhelming, like trying to fly a Lear jet when all that is needed in the beginning, at least, is to bicycle to the grocery store. Happily, novice data journalists do not need to master all the buttons and switches of Power BI to start doing good data stories. Reporters who learn the basics of Excel sorts, filters, functions, and pivot tables will have in hand a multitool that will handle most of the data journalism stories. And they will have a good running start into adding Power BI skills when they start bumping into limitations of what Excel alone can process.



So read this playbook and begin thinking about the data-sourced stories you would like to do for your viewers and readers. You — and they — will be glad you did.

Steve Doig  
Professor, Cronkite School of Journalism  
Arizona State University  
[steve.doig@asu.edu](mailto:steve.doig@asu.edu)

# Intent of this playbook and story results from the pilot

This playbook aims to:

- Outline a data journalism process that can be adjusted for individual needs and gain efficiency over time.
- Share real-world experiences from the KING 5 data journalism pilot project, including examples of the people involved, processes followed, and challenges overcome.
- Introduce Microsoft Excel and Microsoft Power BI as tools for data journalism.
- Provide suggested resources for deeper learning into each step of a project.
- Set guiding principles for journalists to uphold the [Society of Professional Journalists Code of Ethics](#) and other industry standards.

The following data stories were created and published with Microsoft Power BI during the KING 5 pilot:

[“Where does Washington’s marijuana tax money go?”](#)

Aired on August 8, 2018

[“Washington congressional races on track to set fundraising records”](#)

Aired on August 16, 2018

[“Most Washington schools are failing to meet state's target for vaccinations”](#)

Aired on Sept 5, 2018

[“What will Seattle traffic look like without the viaduct?”](#)

Aired on September 18, 2018

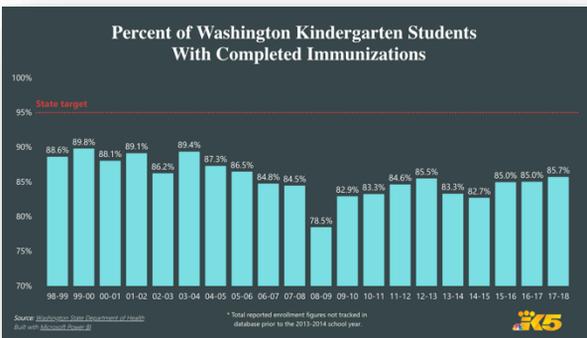
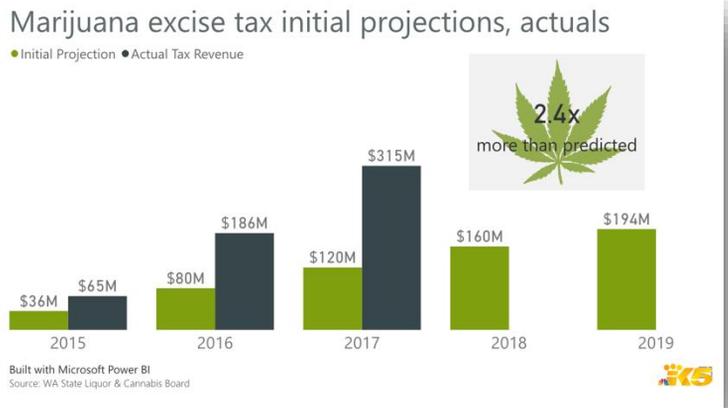
# Results: Data storytelling outperforms traditional storytelling

Results indicate that interactive, data-driven content performs significantly higher than average than traditional content:



**+730% views**  
 compared to average views  
 of stories with broadcast and  
 online mentions in the same  
 6-week period

**+715% views**  
 compared to average views  
 of stories with broadcast  
 and online mentions in the  
 same 6-week period

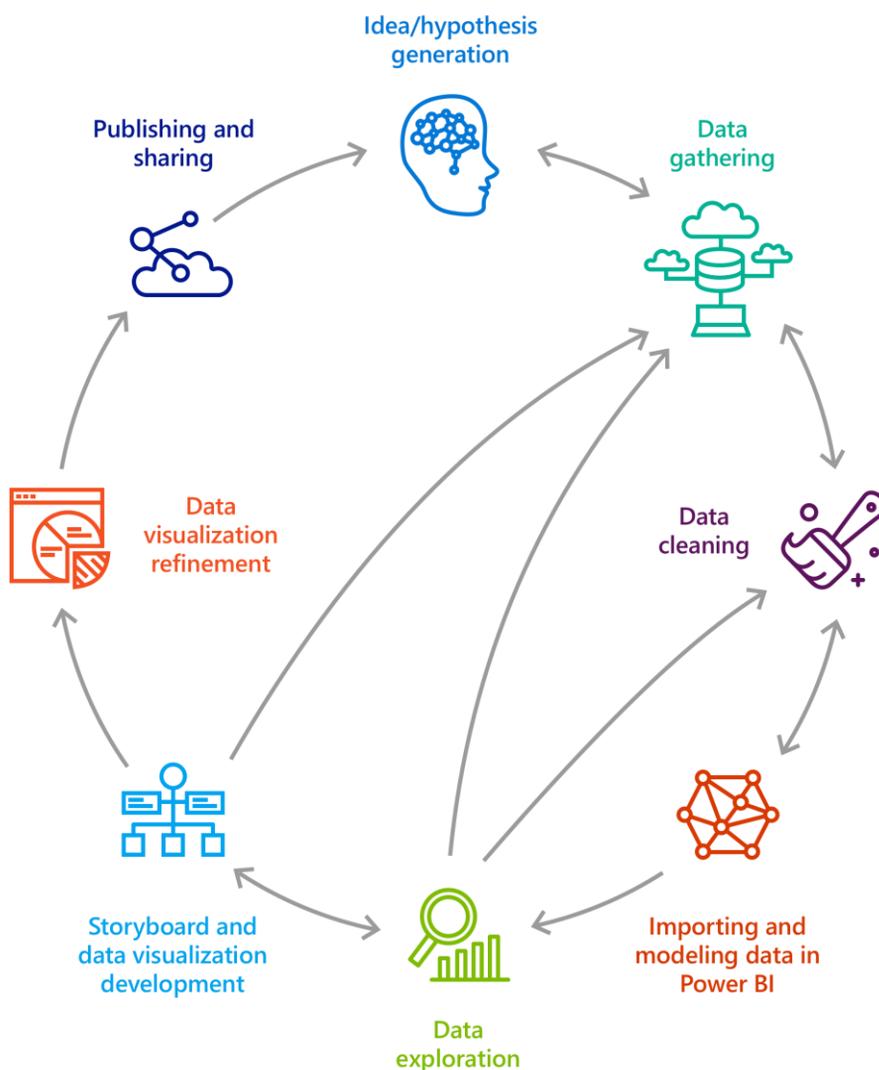


**+510% vs. average**  
 compared to average views  
 of stories with broadcast  
 and online mentions in the  
 same 6-week period

# Data journalism as a repeatable process

Data journalism is an effective way to capture complex information into an engaging infographic-style visualization that audiences can immediately grasp. Data by itself is just a collection of numbers; data journalism is the process of investigating, understanding, and shaping data to tell compelling stories.

As with any reportage, data journalism does not follow a predetermined path. The diagram below offers a series of recommended steps for journalists, analysts, and visualizers as they work together as a data journalism team. The process is not linear; in fact, steps are often revisited and repeated before a story is complete. Each step, however, should be undertaken at least once.



## Time investment

The time it takes to create a data journalism story depends on many factors.

For example:

In the KING 5 pilot, one story aimed to predict how a major traffic flow change would impact morning commutes. Gathering the data required multiple exchanges with the Washington Department of Transportation and the Seattle Department of Transportation over several weeks.

Another project centered around marijuana excise tax revenue: The KING 5 team explored the data and revisited the idea and hypothesis generation steps several times, as the data exploration results repeatedly disproved the initial hypothesis. Eventually, the team settled upon more of an informational story rather than a deep investigation.

The time to produce similar stories will decrease, as journalists in the same group share content, refine processes and gain expertise.

## Gain efficiency by building reusable content.

As the data journalism process is repeated over time, groups will realize efficiencies by maintaining datasets and developing stories that can be reused in the future or in other markets.

## The building blocks of an efficient data journalism model can include the following:

- Defined workflows that map to the repeatable process on the previous page
- Repeatable story outlines
- Repositories of common and useful data sources
- Refined methods of data cleaning, exploration and analysis
- Data visualization templates and style guides
- Publishing processes

### Repeatable story outlines:

Some story outlines are common and repeatable. For example:

- Traffic accidents
- Spending on schools
- Health care cost rates
- Sports
- Crime patterns
- Seasonal weather (drought, floods, snow, fires, hurricanes, cold snaps, heat spells)
- National, state, and local elections
- City demographics, including immigration, homelessness, and unemployment

### Repositories of common and useful data sources:

With repeatable story outlines, the data sources can be refreshed with lesser effort than the first time the story is produced — not only is the origin of the data known (i.e., the contact and/or outlet who provided the data, the URL, etc.), but also the steps to clean, model and analyze the data.

For example:

KING 5 produced a story on congressional voting districts. Years later, the team was able to pull new data, open the existing Power BI data visualization, refresh the underlying data, make minor adjustments, and turn the story around in less than two days.

### Leveraging industry data sources is also an effective way to scale data story production.

News organizations like the Associated Press (AP) regularly release data accompanied by a national story to AP member organizations. Before release, a team of data journalists collects, validates, analyzes, and models the data. By leveraging clean and newsworthy data like this, member newsrooms can more quickly build visualizations relevant to their markets and viewers.

### Refined methods of data cleaning and exploration:

Over time, as journalists become versed in technologies used for data journalism such as Excel and Power BI, they will become more skilled in data cleaning and data exploration. Integrating data experts on the reporting team can reduce the time to produce stories, as journalists will be able to narrow in on their story hypothesis faster.

### Data visualization templates and style guide:

Storytelling often follows a recurring pattern. Telling stories with data is no different. With data visualization templates, discussed in more detail in a later section, moving from data exploration to storyboarding and data visualization can be a much easier transition.

Defining on-brand color palettes simplifies creating data visualizations, reduces cycle time, and reinforces a brand identity. Approved color palettes should already be tested to be visible to people with colorblindness and to show

up well on TV. Establishing style guides can also reduce cycles in refining the data visualization by conforming to visual design best practices.

For example:

The KING 5 pilot project launched without a style guide. The data visualizations on the traffic forecasting story needed significant tuning prior to airing on TV and publishing to the web. By the second story, a data visualization template had been put in place. The last story required just 20 percent of the time in the data visualization refinement step compared with the traffic forecasting story.

Maintaining a consistent look and feel will help build the station and group brand, as well as the audience's familiarity with what to expect with data stories.

### Publishing process

Documenting a publishing process for every broadcast and web story will reduce confusion, help ensure steps are not missed and keep team members on the same path.

“

Storytelling often follows a recurring pattern.

Telling stories with data is no different.

”

## Myths and misconceptions

KING 5 started with many myths and misconceptions about data journalism.

Data Journalism stories can be turned around in a couple of days or less.

Producing stories can take anywhere from a few days to several weeks. Even when a process has been established, chasing the data trail takes time.

Journalists can learn everything they need to know to be self-sufficient in producing data journalism stories.

This is not necessarily false, but the team quickly learned that the complexity involved in data exploration and data visualization would leave journalists little to no time for the actual reporting.

Data delivered in the form of PDFs, PowerPoint, or in email is useful.

Data in PDFs, PowerPoint or email are not useful in the context of data exploration because information in these formats is not easily machine-readable. This will be discussed in greater detail later in the playbook.

What you see on your screen when developing Power BI visualizations will be what the audience sees on TV.

It is always important to do a dry run of your story in the studio on the Surface Hub to ensure that your data visualizations will be readable by the TV audience. Even when station branding and approved color palettes are used, other unexpected issues may arise, from hard-to-discern font size to the type of data chart used.

## Learning resources

The Data Journalism Handbook is used by students, researchers and practitioners learning about the state of the ever-evolving field of data journalism.

<https://datajournalismhandbook.org/handbook/two#introduction>

Investigative Reporters and Editors (IRE) is a nonprofit organization that offers resources, conferences and specializing training, including the Computer Assisted Reporting conference for data journalists. [www.ire.org](http://www.ire.org)

Based in the University of Texas at Austin, Knight Center for Journalism in the Americas leads professional training and courses in Latin America and the Caribbean.

<https://www.knightcenter.utexas.edu/>, <https://journalismcourses.org>

The European Journalism Centre offers resources including handbooks, courses, discussions and more through its portal: <https://datajournalism.com>

# Technology to enable the process

By using Excel and Power BI together, you can follow steps in the data journalism process to discover, create and share powerful data-driven stories.

## Introduction to Microsoft Excel

The world's most widely used data and analytics tool, Excel can help anyone from novice to pros turn data into insights.

You can use Excel to create simple or complex spreadsheets from templates or from scratch. Once the data is entered, Excel can apply formulas to organize data and build powerful models. Enhanced by intelligence, the app can learn users' patterns to auto-complete information (such as dates or states) with features like Flash Fill and Smart Fill, recognize stock information, or flow geographical indicators like zip codes to a map.

Excel also makes it possible to connect, mash up and clean data.

The tool also offers a variety of charts and graphs such as Waterfalls, Tree-maps, map charts and pivot tables to visualize your data in new ways. Bars, colors, and icons help highlight patterns or trends in what would otherwise be a mass of information.

"Excel is the easy-to-learn gateway drug to data journalism addiction."

– Steve Doig, Arizona State University

10

Excel is offered through the Microsoft Office 365 suite for effective collaboration. Sharing cloud-synced workbooks allows users to work together on the latest set of numbers. Overall, Microsoft 365 provides a universal toolkit for securely managing and sharing files. This includes deep security and information protection, robust version control and auditing, and secure sharing and collaboration both within and outside an organization.

## Introduction to Microsoft Power BI

Power BI is a business intelligence dashboard used across industries by organizations of all sizes. While its main use is business intelligence, many journalists and storytellers use Power BI to discover, visualize, and share interactive data stories online and on TV.

Power BI is a collection of software services, apps and connectors that work together to turn unrelated sources of data into coherent, visually immersive, and interactive insights. Whether data pulls from a simple Excel spreadsheet or a collection of cloud-based and on-premises hybrid data warehouses, Power BI easily connects to data sources and enables users to visualize (or discover) what's important, and share.



Power BI can be simple and fast – capable of creating quick insights from an Excel spreadsheet or a local database. But Power BI is also robust and enterprise-grade, ready for

extensive modeling and real-time analytics as well as custom development. So, it can be your personal reporting and visualization tool, and also serve as the analytics and decision engine behind group projects, divisions, or entire corporations.

Power BI consists of a Windows desktop application called Power BI Desktop, an online SaaS (Software as a Service) called the Power BI Service, and mobile Power BI apps for phones and tablets. These three elements — desktop, service, mobile — allow people to create, share and consume business insights in the way that serves them, and their audience, most effectively.

Typically, data journalists use the Power BI Desktop application for all the steps defined in the data journalism as a repeatable process model, except for the publication and sharing of the content. The Power BI Service enables users to publish the reports built in desktop to Microsoft Cloud, making it easy to share the data stories with audiences.



## Learning resources

### Learn more about Excel

Visit the Excel help center to find training, support and news.

<https://support.office.com/en-us/excel>

### Power BI in the news

See how other journalists are using Power BI for data stories.

<https://microsoft.baa.nz/>

### Power BI for Data Journalism

To get deeper into the tool and become more self-sufficient, go through the Power BI data journalism onboarding tutorial on Microsoft's website.

<https://powerbi.microsoft.com/en-us/datajournalism/>

### Power BI Guided Learning

Follow the on demand guides learning for Power BI.

<https://docs.microsoft.com/en-us/power-bi/guided-learning/>

### Power BI Community

Share ideas, get support, submit feature requests and engage with other data enthusiasts in the community.

<https://community.powerbi.com/>



# Idea and hypothesis generation



Many ideas lend themselves well to data journalism — and an equal number of ideas that do not.

## *What works and what does not?*

A great online data journalism story invites audiences to interact with the data itself, explore it visually, and uncover insights on their own terms. Many journalists find that this engagement builds trust in the news, strengthens communities, and builds a personal and news outlet brand.

The best way to frame your thinking around idea and hypothesis generation is to consider that by producing publicly available data, we could lead the narrative on stories of interest in our communities, whether that is locally, regionally, or nationally.

“

“... the idea and hypothesis generation stage can result in a different outcome than expected.”

”

Stories produced during the KING 5 pilot:

[“Where does Washington’s marijuana tax money go?”](#) Aired on August 8, 2018

[“Washington congressional races on track to set fundraising records”](#) Aired on August 16, 2018

[“Most Washington schools are failing to meet state's target for vaccinations”](#) Aired on Sept 5, 2018

[“What will Seattle traffic look like without the viaduct?”](#) Aired on September 18, 2018

The KING 5 team for instance researched the issue of domestic migration but decided not to move forward with the story when they discovered the data available was not current and did not prove meaningful trends. This is a good example of how working through the idea and hypothesis generation stage can result in a different outcome than expected.

The stories that were reported represented four areas of heavy public interest. For example, the station received many calls from the community asking where the marijuana tax money was going — in particular, if the funds were indeed paying for schools or roads. KING 5 showed that marijuana excise tax revenue was allocated mostly toward public health and substance abuse prevention. Moreover, the tax represented only 1.43% of all tax revenue and .49% of the total budget.



# Idea and hypothesis generation



## Go deeper and bring your audience!

Data journalism aims to educate its audiences to grasp the insights gleaned from massive quantities of data through easy-to-understand visualizations.

Rather than just telling a story, good data journalism starts a conversation.

Good visualizations can expose hidden relationships, simplify the complex, and allow the audience to engage with the data. Microsoft Power BI allows stories to be shared with interactive data visualizations viewable on any device.

When selecting an idea and formulating a hypothesis to pursue for a data journalism story, keep your audience and the data available in mind to maximize your impact.

“

Visualizations can expose hidden relationships, make the complex appear simple, and allow the audience to engage with the data.

”



## Learning resources

### Data Journalism Award Winners

Get inspired by exploring what other journalists have done.

<https://datajournalism.com/awards>

### Women in DataViz Twitter list

Keep up this open, evolving Twitter list of the female talent working with, studying and making dataviz.

<https://twitter.com/sarahslo/lists/women-in-dataviz>

### NYT Graphics Twitter

Keep up to date on data visualization in journalism by following one of the industry leaders.

<https://twitter.com/nytgraphics>



# Data gathering



Once you have your idea or test hypothesis, the next step is finding and gathering data.

Data can come from a variety of different public and private sources, in a dizzying variety of files and formats.

“

Whenever possible, request the most granular level of information.

”

## How to request data

If you are requesting data from a public or private contact, be clear on what you mean by data:

1. Whenever possible, request the most granular level of information.

This means raw data that has not yet been aggregated (grouped) or transformed in any way. This is important because aggregated data forces you to look at the data in terms of the groupings already applied to it, such as percentages. Granular data allows you to look at the data from any perspective to uncover trends that might be hidden and define the formulas of any transformations you apply to the data in the data exploration step.

2. Be sure to request data in a machine-readable electronic format and supply examples, such as Microsoft Excel workbooks, comma-separated value (.csv) files, and .xml file formats.

Scans of paper documents, microfiche, .pdf files, emails or Microsoft Word documents are examples of file formats that can be incredibly difficult to work with for data exploration.

3. Always request a data dictionary or record layout.

This will help you understand the context of the data and should include things like descriptions of fields and code values, how missing data is handled, and formulas for any aggregations applied.

4. Request that sensitive data, including personally identifiable information (PII), be removed before sending it to you, unless you absolutely need this data for your story.

Be careful with datasets that include sensitive information. When in doubt, consult newsroom management and newsroom counsel.



# Data gathering



## What worked well in the KING 5 pilot?

Immunization data was easy to acquire and analyze, as the state of Washington stored information online in Excel spreadsheets, with documentation of what data fields meant and how the data was gathered.

## What did not work well in the KING 5 pilot?

The data for the traffic forecasting story was in a difficult format. The Seattle Department of Transportation and Washington Department of Transportation provided a lot of data in Excel, but a considerable amount of other data was delivered in more than 100 PDFs of scanned printouts from traffic reader machines formatted with COBOL output. To use this data, considerable time had to be invested to copy out individual data points from the scanned PDFs. Remember, it is always best to be clear with your contacts that you need data that can be machine-readable and communicate what this means if your contact is not sure.

## Public sources of data

Governments, universities, research institutions and private companies publish robust, publicly available datasets that are well-documented and supported by professionals.

From the Seattle Department of Transportation to Zillow Research, an ocean of data is available and ready to be mined. Non-governmental organizations (NGOs) and nonprofit agencies also often make their data available for use, and effective use of data can support their missions. Lastly, with the growing popularity of Data Science competitions, many thousands of datasets covering a vast number of subjects have been created and shared around the world.

## Leaked or hacked data

Many risks come with leaked or hacked data. We recommend extreme vigilance to avoid personally identifiable information, viruses, and malware. Be sure to seek the advice of your station manager and news director and refer to the AP's Briefing on Media Law before using any leaked or hacked data.

### Excel tip

When you are working with multiple data files, the Get & Transform function pulls data into Excel, including from other Excel files. Interlinking data means that the designated master Excel file can be refreshed any time without the need to copy and paste from other workbooks so you can keep a single version of the truth. All queries, data models and reports created in Excel can be transferred to an interactive dashboard in Power BI. This feature is a common foundation between the two apps.



# Data gathering



## Storing data

Establish detailed infrastructure and protocol when saving data projects to a central location for your team or organization, such as in a designated Teams channel and/or SharePoint in Microsoft 365.

Just like a good style guide, establishing best document-management practices, like file-naming conventions and backups, will enable version control and help groups work more efficiently. Files saved in Teams and/or SharePoint can also be imported into Power BI as a data source, making it easier for multiple people to collaborate on data exploration and the development of data visualizations in Power BI.

If your data is large (gigabytes in size and hundreds of millions or billions of records), it is best to store this data in a cloud service, such as Azure SQL Data Warehouse.

Before storing and using any data source, take the time to assess how current the data is, its accuracy, and the reliability of its producers. Additionally, decide if the data source is free from any biases where possible, or at least note what the bias is. (See section on finding bias in the appendix.)

*Always appropriately notate your data sources in your published work.*



## Learning resources

### **Knight Center for Journalism in the Americas**

Based in the University of Texas at Austin, the Knight Center leads professional training and courses in Latin America and the Caribbean.  
<https://www.knightcenter.utexas.edu>,  
<https://journalismcourses.org>

### **DataJournalism.com**

The European Journalism Centre offers resources including handbooks, courses, discussions and more.  
<https://datajournalism.com>

### **Associated Press Stylebook**

The AP Stylebook includes a chapter on data journalism.  
<https://www.apstylebook.com>

### **Getting and cleaning data in Power BI**

Learn how to get data.  
<https://docs.microsoft.com/en-us/power-bi/guided-learning/gettingdata>

### **Excel Get & Transform and PowerPivot**

Master these powerful features.  
<https://support.office.com/en-us/article/Get-Transform-and-PowerPivot-in-Excel-42D895C2-D1D7-41D0-88DA-D1ED7ECC102D>

### **Freedom of Information Act Request**

Learn how to request a Freedom of Information Act. <https://www.foia.gov/>

See sample FOIA request letters at <https://www.nfoic.org/sample-foia-request-letters>



# Data cleaning



## Messy data is everywhere.

Fortunately, the tools and methods to “clean” data are widely available, free, or low-cost and flexible enough to apply to all data you will encounter. Journalists may choose to partner with data specialists to ensure that data is clean and accurate. The following five principles underscore the core concepts of data quality.



## Completeness

Are all relevant data items recorded? For example, if you are attempting to explore crime data for a major city, are all districts represented in the data? Check for null values and be critical of omissions.



## Consistency

Is the data formatted the same way across the entire dataset? Was the way in which the data was recorded consistent over time? For example, if your data includes U.S. state names, all state names should be completely spelled out or abbreviated, not both. Or, if a health index score had been for 20 years recorded on a scale of 1-100, and then switched to a 1-500 scale, this discrepancy will need to be adjusted in your data. Be careful with historical data, as inclusion and measurement methods (or, in the case of economic figures, inflationary values) may have changed over time.



## Uniqueness

The third principle refers to a single view of the dataset with no duplication in the numbers. For example, if your aim is to measure total car accidents over time in the state of Washington, and accidents in the city of Spokane are duplicated each year, the result will be erroneously inflated.



“

Journalists may partner with data specialists to ensure that data is clean and accurate.

”



# Data cleaning



## Integrity and validity

Is the data unchanged from its source? Data integrity is considered intact if the data is whole and intact and has been unaltered since its creation in any material way. Data is said to be valid if it conforms to the format, type, and range of its syntax definition.



## Accuracy

How well does the data describe the real-world event or object being represented? For example, if your story idea is to compare post-graduate education costs against the average income of 20- to -30-year-old working professionals over the past 10 years, but your data is sourced from 1955, your data is not accurate. Consider another example: Identifying the gender pay gap by comparing average pay of people is an incomplete and inaccurate portrait. Instead, comparing pay within industries as well as experience levels provides a more nuanced and accurate story.



## Tech tip

Before importing data into Power BI, depending on the nature of data cleanliness issues, it might make sense to clean the data first in Excel. Power BI does include functions to clean and transform data. However, since only a subset of data may be used for a visualization, it may be best to clean the entire dataset. For example, Excel is the best tool to complete the following tasks:

- Change a column of data from a decimal to a percentage or whole number, or if you want to extract data elements from a column of dates.
- Remove duplicate records, replace text values with different text values, correct non-printable characters or date and time values.
- Cleaning large datasets (from a few thousand rows of data, up to a million rows of data). For data with more than one million rows, it is best to use enterprise-grade data engineering tools such as Microsoft SSIS. Data experts, working alongside the journalist drafting the story, can often complete these tasks.



# Data cleaning



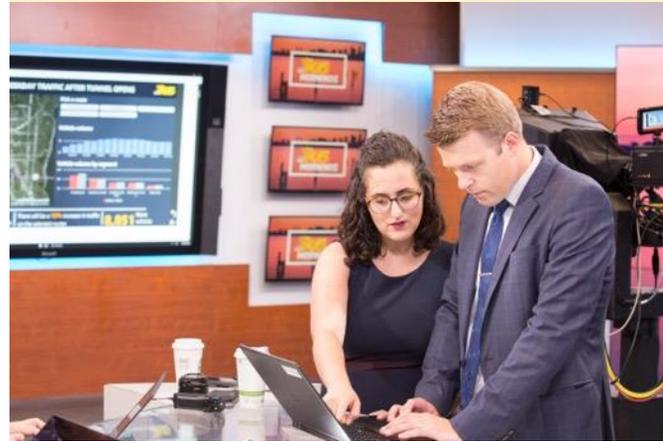
Tools like Microsoft Excel and Power BI can dramatically decrease the time and effort needed to clean data. Investing in learning technology or hiring experts can have a profound impact on the data literacy and data culture across an organization.

For example, cleaning your data with reusable steps in Power Query saves you time by splitting columns, merging tables, or removing duplicates. Power Query is available in both Excel and Power BI.

Once the data is cleaned and the models are built, the Schedule Data Refresh automates data updates. The data sources configured in Power Pivot refresh in the background. When the dashboard is opened, the right data will be there — without requiring any action.

Always back up the original data files before making updates in Excel and keep a record of the changes if you expect to get an updated version of the data with similar inconsistencies. Some central storage solutions often have version histories, but that should be relied upon only in the cases of emergency.

At this point, you will be gaining insights into your information that will help you begin to discover the story. As you continue through the data journalism process, visualization tools in both Excel and Power BI offer ways to explore and present data.



## Learning resources

**Top 10 ways to clean your data in Excel**  
Microsoft's top 10 ways to clean your data in Excel will have you moving fast in no time.

<https://support.office.com/en-us/article/Top-ten-ways-to-clean-your-data-2844B620-677C-47A7-AC3E-C2E157D1DB19>

### Power Query

Power Query, (also known as Get & Transform) provides an intuitive and consistent experience for discovering, combining, and refining data across a wide variety of sources in Excel and Power BI.

<https://support.office.com/en-us/article/get-transform-in-excel-881c63c6-37c5-4ca2-b616-59e18d75b4de>



# Importing and modeling



## Getting data into Power BI is straightforward

This section serves as an introduction to 1) help you decide if you need or want to pursue to more advanced training or 2) give you the basic tech fluency to work with experts. Either way, Microsoft provides online guided learning to make the steps fast and easy to learn. Microsoft also hosts training specifically for journalists.

At this stage in the repeatable process for data journalism we have transitioned from Excel to Power BI, so the guidance below assumes you are using Power BI for these steps. Excel also offers powerful data modeling capabilities.

## Importing

Excel and Power BI work with data from many sources and in many formats. Power BI can connect to data from files, databases, Microsoft Azure, and many other online services. It also provides tools for developers to create custom connectors for new data sources.

Once the data is imported you can refresh data with one click, and if the report is published to the Power BI Service you can schedule automatic updates.

Importing data into Power BI does not replace or modify the source files, it provides the tools to define and apply repeatable steps to transform the data. This provides transparency for the methodology by providing a record of steps for others to recreate or reverse. If you are cleaning or modifying data in another tool it is important to record your process and keep versions of your unaltered and transformed source files.

## Data modeling

Likely data scientists will handle complex data modeling activities; however, a little understanding and time will enable you to create well-structured and well-named data models. This allows you to easily visualize your data to find and highlight the stories it contains.

## Tables

Building a data model involves importing data from various sources into tables. Tables provide structure to organize your data and apply decisions like how granular your data should be, and how to pivot it. Creating relationships between the tables will allow you to look at and perform calculations on related groups of data within the tables.



# Importing and modeling



20

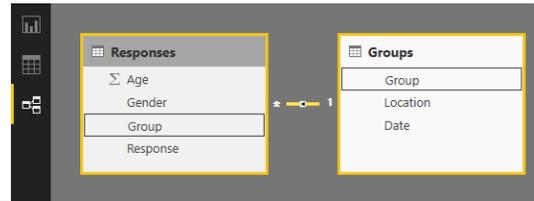
## Import data into tables

Queries [2] < fx = Table.TransformColumnTypes(Source,{{"Age", Int

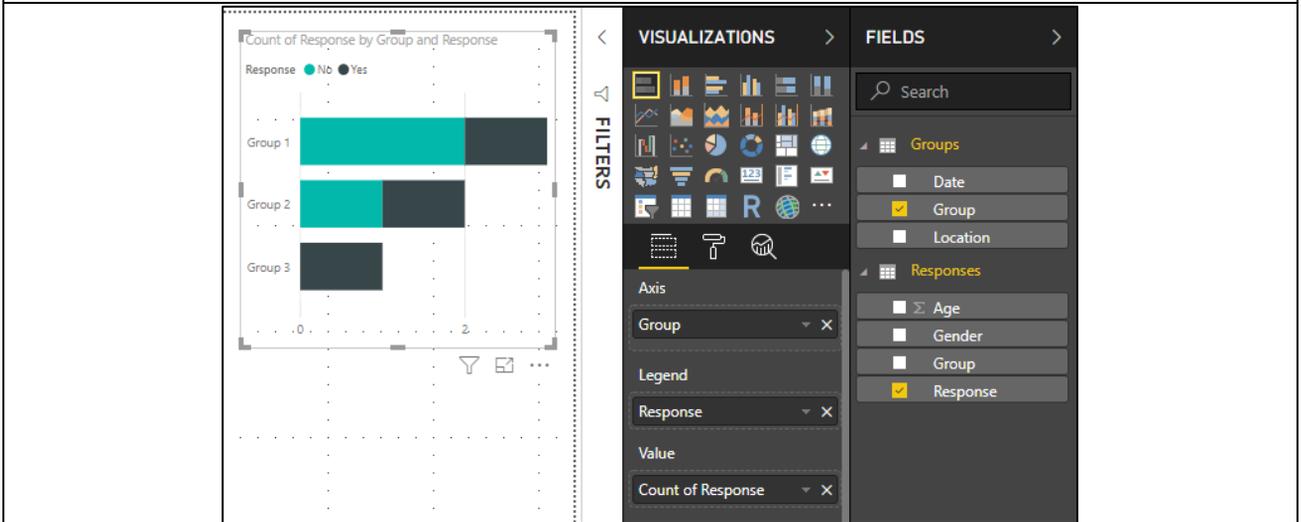
	Age	Gender	Group	Response
1	20	Female	Group 1	Yes
2	22	Male	Group 3	Yes
3	25	Female	Group 1	No
4	26	Female	Group 2	No
5	30	Male	Group 2	Yes
6	34	Male	Group 1	No



## Build relationships



In Power BI reports, users drag and drop fields into the report canvas. The relationships defined in the data modeling step assist in visualizing and performing calculations on groups of data.



Think of a spreadsheet with columns and rows. A sheet has a table of data, and each column in this table will become a field that you can drag and drop into a Power BI visualization to slice your data in several ways.

In the simplest sense your data is made up of categorical and numeric fields.

- Categorical, also known as qualitative, fields can be used to group your data. Examples of categorical fields include gender, education level, state, or zip code.
- Numerical, also known as quantitative fields, can be used in mathematical calculations like sums or averages. A simple test is to ask: "Can I do arithmetic on this field?"

Tables in Power BI can include any number and combination of these field types and can be modelled in structured ways depending on the complexity of the data and the requirements for reporting. In a



# Importing and modeling



report, a single table may be enough.

## Granularity

As mentioned in the Data Gathering chapter, understanding the difference between fine- and coarse-grained data will help when requesting data. Getting data at the right level of detail early also makes modelling easier and will give you more flexibility when building reports and sharing your methodology.

Granularity refers to the level of detail in a table, model, or dataset. The finer the level of detail in your data, the more flexible it will be to work with. You can slice and aggregate data in Power BI to view it from different perspectives to find insights, patterns, or trends. This is all considered 'modeling your data.'

A table containing the response to a question along with the respondent's gender and age with one response on each row is more fine-grained than the same data provided as a percentage of positive responses to that same question grouped by age and/or gender.

Fine-grained				Course-grained		
1	20	Female	Yes	1	20 - 24	100.00%
2	22	Male	Yes	2	25 - 30	50.00%
3	25	Female	No	3	30 - 34	50.00%
4	26	Female	No	4	Male	66.66%
5	30	Male	Yes	5	Female	66.66%
6	34	Male	No			

In the course-grained example we cannot model the data to redefine our age range or ask simple questions like 'how many people were surveyed' or 'how many women ages 20-24 responded Yes.'

This can impact your ability to tell a data story because if your data is already aggregated it will be course-grained and you will be limited to looking at the data using those categories. It is difficult and often not possible to un-aggregate data, so this will restrict the ways you can slice the data, limit the stories you can find and the interactivity of your final report.

## Relationships

You can enhance your data model by mashing-up different datasets against your existing data. For example, if your data only contains a state abbreviation you can bring a dataset containing full state name, populations, and capitals into Power BI as a separate table.

Data modeling allows you to define relationships between different datasets using fields they have in common such as names or identifying numbers. Power BI then utilizes these relationships to cross-filter the data depending on selections you make. This enables you to quickly explore the



# Importing and modeling



data, find anomalies, see different slices of the data, and identify trends without needing to combine or slice the data manually.

Power BI automatically detects the keys between your tables when the data is imported and defines the relationships for you.

## Pivoting and un-pivoting

In Power BI, pivoting is a way to transform a table from a tall narrow table to a short wide table by moving the values from multiple rows and making them the values in columns of a single row.

A <sup>B</sup> State	A <sup>C</sup> Gender	1.2 Population
1 Alabama	Female	2499965
2 Alabama	Male	2350806
3 Alaska	Female	352246
4 Alaska	Male	386319
5 Arizona	Female	3424891
6 Arizona	Male	3385055



A <sup>B</sup> State	1 <sup>2</sup> Female	1 <sup>2</sup> Male
1 Alabama	2499965	2350806
2 Alaska	352246	386319
3 Arizona	3424891	3385055

Un-pivoting performs a similar operation in reverse. You can select a collection of columns that you want to categorize and create an Attribute-Value pair.

A <sup>B</sup> State	1 <sup>2</sup> Female	1 <sup>2</sup> Male
1 Alabama	2499965	2350806
2 Alaska	352246	386319
3 Arizona	3424891	3385055
4 Arkansas	1516293	1461651



A <sup>B</sup> State	A <sup>B</sup> Attribute	1.2 Value
1 Alabama	Female	2499965
2 Alabama	Male	2350806
3 Alaska	Female	352246
4 Alaska	Male	386319
5 Arizona	Female	3424891
6 Arizona	Male	3385055

Working with a model that includes un-pivoted data can be incredibly useful. When groups or names are in one column, and values are in another, you can group and slice by the name column and aggregate the data to get totals, sums, or averages from the value column.

Understanding how and when to pivot and un-pivot data will improve your ability to model the data to suit your needs.

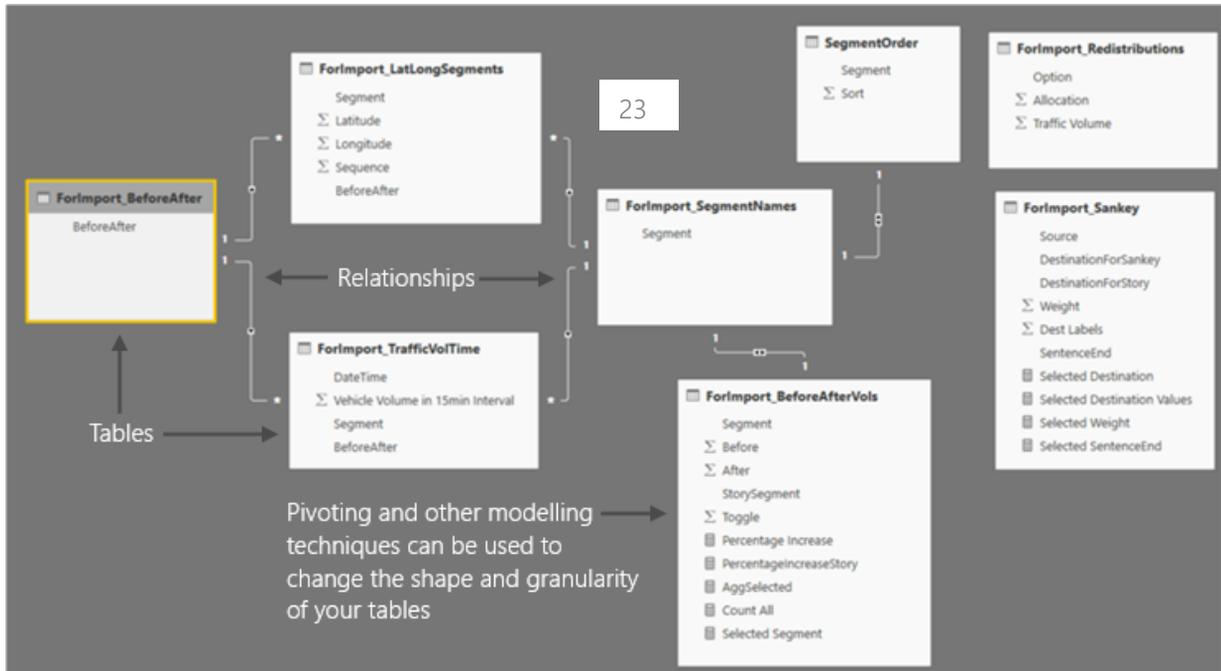
## Summary and KING 5 case study

Data modelling ideas and concepts like tables, granularity, relationships, and pivoting can empower tech-fluent journalists to be more self-sufficient when performing data analysis and creating data visualizations; and help you better understand how to gather and prepare data that is easy to work with in Power BI.

These principles can be used to create clear and concise data models. KING 5's traffic projection story, shown in the screenshot below, is a good example:

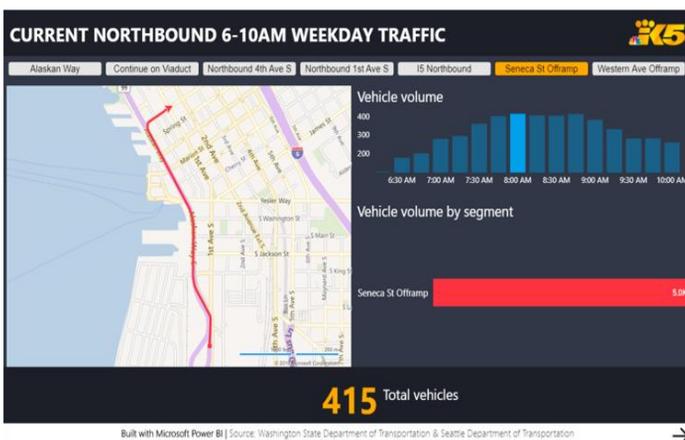


# Importing and modeling



Sophisticated data modelling enabled the KING 5 project team to solve an interesting challenge. The goal of the story was to present a map within the report showing all affected routes at once, while also enabling users to select any combination of "segments" (the data label for traffic routes), and times of day, to view correct vehicle volume totals. To achieve this, different data tables were created for each data point: (1) route location, (2) before and after volume, and (3) volume at specific times. A fourth table was created containing the "segment" name, a data point common to the other three tables. This allowed for the desired visualizations and slicers.

This screenshot shows a view of the report with the various slices selected:



## Learning resources

### Power BI guided learning

Microsoft Power BI provides guided learning on modeling data, visualizations, and much more.

<https://docs.microsoft.com/en-us/power-bi/guided-learning/>

### Create a data model in Excel

Follow the steps to integrate table from multiple tables.

<https://support.office.com/en-us/article/Create-a-Data-Model-in-Excel-87E7A54C-87DC-488E-9410-5C75DBC0F7B>



# Data exploration



**Prove or disprove your hypothesis, develop your story idea, and unlock insights buried in your data.**

The potential of Power BI for data journalists is in its ability to be the tool that allows you to create and share engaging data visualizations, as well as to drive efficiency by being a rapid data exploration tool.

Now that you have loaded your data into Power BI Desktop, it is ripe for exploration. By playing with the data, you will be able to prove or disprove your story hypothesis, realize the need for additional supporting data or discover hidden trends that may take your story in a different direction altogether.

As you move through your data analysis and exploration, you may want to work with a data specialist to document any calculated metrics you create or data transformations you employ. From this, you may share your methodology documentation.

Additionally, keep in mind the list of biases to avoid, shared in the appendix. The golden rule is that all insights shared within a data journalism story should be reproducible and ideally, as straightforward as possible. Examples of goals you may want to set include providing transparency, making the complex appear simple and initiating conversations.

## Exploring your data

A benefit of Power BI is that you can easily try out many different visuals without coding. Depending on your data and the analysis you want to do, the first visual you bring into your report canvas may be as straightforward as a graph, table, or map, or as unique as a ribbon chart or waterfall. You can also add things like slicers to slice the measures or facts tied to your graphs, maps, or tables. We will discuss more about what visuals are available in the next section.





# Data exploration



By dragging a visual into your report canvas, followed by dragging attributes from the tables of data you have imported into Power BI into the fields pane, you can start to interact with your data. Note that selections made to a visual in the report canvas affect other visuals.

For example, imagine you want to create a filled map visual of the United States the day after the national elections. The map has two characteristics: States are colored by the prevailing political party, and a card visual shows the total number of voters. By default, the card visual will show the sum of all U.S. voters. Select a state, and the card will change to show the number of voters of that state.

In addition to the visuals available by default, Power BI is supported by an enormous online community of developers who create custom visuals. So, if there is a particular visual that you would like to use but do not see in the default visuals library, search the online marketplace for free visual add-ons.

In some cases, you may commission a developer to build a new custom visual for your story.

To view custom visuals, visit:

<https://appssource.microsoft.com/en-us/marketplace/apps?product=power-bi-visuals&page=1&src=office>

## Establish meaningful comparisons, find anomalies and report on trends.

Data exploration and analysis are powerful tools to help build the credibility of your story and establish impartiality. During this step, you prove or disprove your hypothesis and uncover insight.

### Comparisons

Meaningful comparisons will help your viewers and readers understand the story. For example, if your story is to show how much state spending is allocated to K-12 education, providing an absolute dollar figure by itself is not as meaningful as including K-12 education spending as a ratio of overall state spending. Even more pertinent is to compare this figure to other states, after normalizing population size differences and economic wealth.

### Relationships

The strength of relationships, also called the correlation between variables, can lead to important stories.

For instance, an x-y scatterplot of the relationship between poverty and school test scores will generally show a strong negative relationship: As poverty levels go up, test scores typically are lower.

### Correlation and Causation?

However, beware of assuming that a correlation between two variables means that one is causing the change in the other. It makes some sense that the burdens of poverty could be a cause of differences in test scores, but many correlations are spurious.



# Data exploration



For instance, a strong positive correlation exists between the numbers of liquor stores and the annual number of divorces in cities. Is alcohol causing divorce, or are shaky marriages causing alcohol sales?

Neither: The hidden variable affecting both datasets is population size.

## Anomalies

Finding anomalies is a valuable tool in data analysis. For example, a strong positive correlation would normally exist on a scatterplot of school test scores from this year against last year. Consequently, look for schools that do not follow the pattern, showing a significant improvement in scores from one year to the next. Either there is a delightful story about an innovative teaching program being used – or a relevant story about teachers pressured to raise scores by cheating. The data will not tell you which, but it will lead you to where more reporting will uncover the story.

## Trends

Lastly, identifying trends and how they develop over time can be an effective narrative frame. If your story is on climate change, for example, a clustered bar chart showing the shifts in ocean temperature, fish population and carbon dioxide levels over time can help illustrate the impact of climate change. As a best practice when showing change over time, use a vertical bar graph. Use a horizontal bar graph when showing absolute change.

For more information on understanding data variable relationships, please see the Appendix section entitled “Understanding and preventing bias.”

“

...investigating where trends exist and develop over time can be an effective storytelling tool.

”



## Learning resources

### edX Course on Excel

This free 6-week training course provides advanced training on analyzing and visualization data in Excel.

<https://www.edx.org/course/analyzing-and-visualizing-data-with-excel-2>



# Storyboard and data visualization



## Crafting the narrative of your story and selecting the best visuals to aid in its telling.

You have explored and analyzed the data, gathered additional information from your sources and uncovered your key insights. By now, you should have locked in on your findings and are ready to draft the story. As a journalist, this step is the most familiar — and exciting.

To ensure you are representing the data component of the story, put yourself into the shoes of a person who is brand new to your subject and has not yet been through the journey you have. What are the most important, logically sequenced steps needed to arrive at your key insights? How would you explain this to a family member or friend?

Just as you would for your other stories, introduce the hypothesis or idea, present the core issue, and create interest by explaining why it is important to the audience. Unfold the storyline, in clear, succinct steps, and build to the climax of the story. Consider what you want the data visualizations to communicate at first glance. Ensure your headline, visual choices and supporting text or charts are giving the viewers and readers the information you want to share.

Sometimes, having spent a considerable amount of time working up to this point, the tendency is to want to include more details than are necessary.

Data overload may obscure the storytelling. Remember, you will share your complete methodology in the

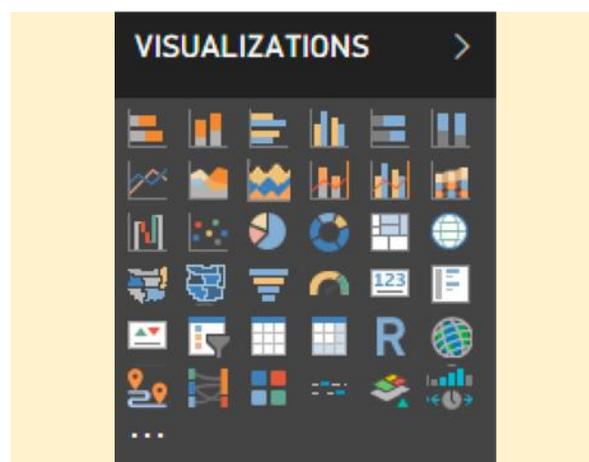
story notes. In telling the story itself, you must achieve just enough detail to make each step led to the next, and no more.

## Choosing the right visuals

You can choose from hundreds of visuals in Power BI. To help guide your decision-making on choosing visuals, remember that the goal is to make your data visualizations engaging, inviting and interactive.

As noted in the data exploration section, Power BI is supported by an enormous online community of developers who create custom visuals. So, if there is a particular visual that you would like to use but do not see it in the default visuals provided, you can search the online marketplace for free visual add-ons.

When you are viewing your report in Power BI Desktop or editing a report in the service, this can be found by clicking on the ellipsis in the VISUALIZATIONS pane in Power BI, then clicking on the “Import from Marketplace” option:

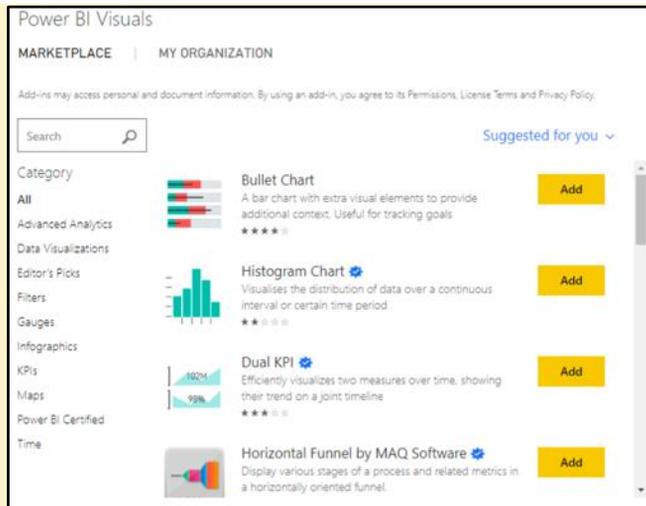




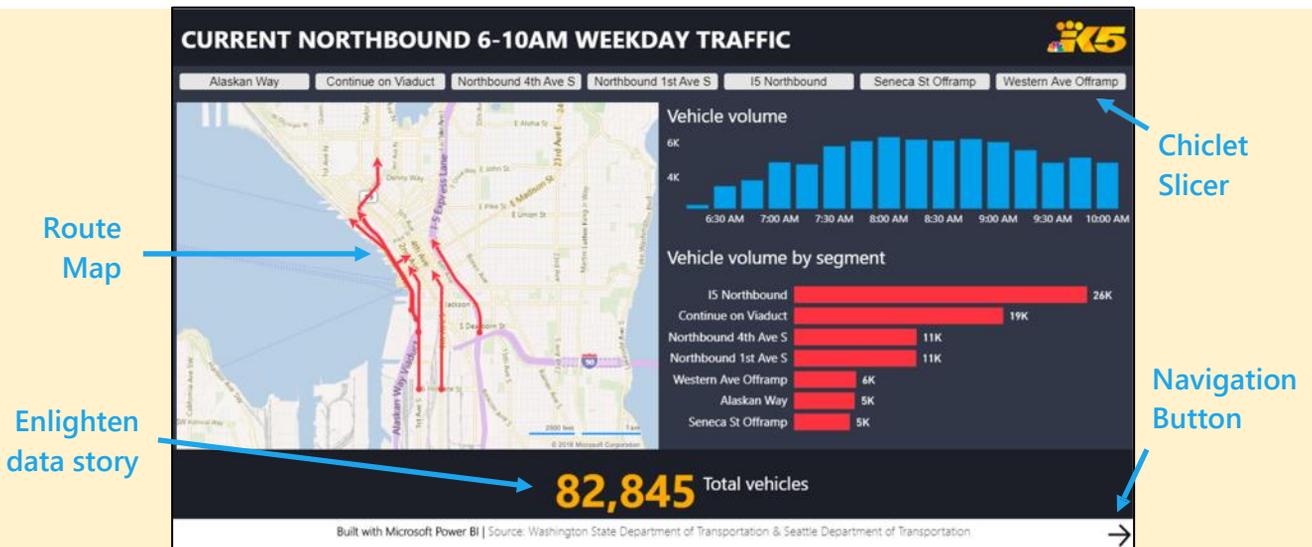
# Storyboard and data visualization



Within the marketplace, you can browse custom visuals by category or search for them by name:



For example, the KING 5 team wanted to show how traffic changed on routes in Seattle after the tunnel opened: The team chose the "Route Map" custom visual to show the routes color-coded on a map, "Enlighten Data Story" to display the changes in route volume at the bottom and "Chiclet Slicers" to select routes and years:



The team also placed text boxes on the report canvas, encouraging users to click through specific visuals. Users were prompted to click through "Chiclet Slicer" buttons to compare traffic volumes on different routes of Seattle.

A navigation bar was included to create a familiar user experience. This prompted users to advance to the next chapter of the story.

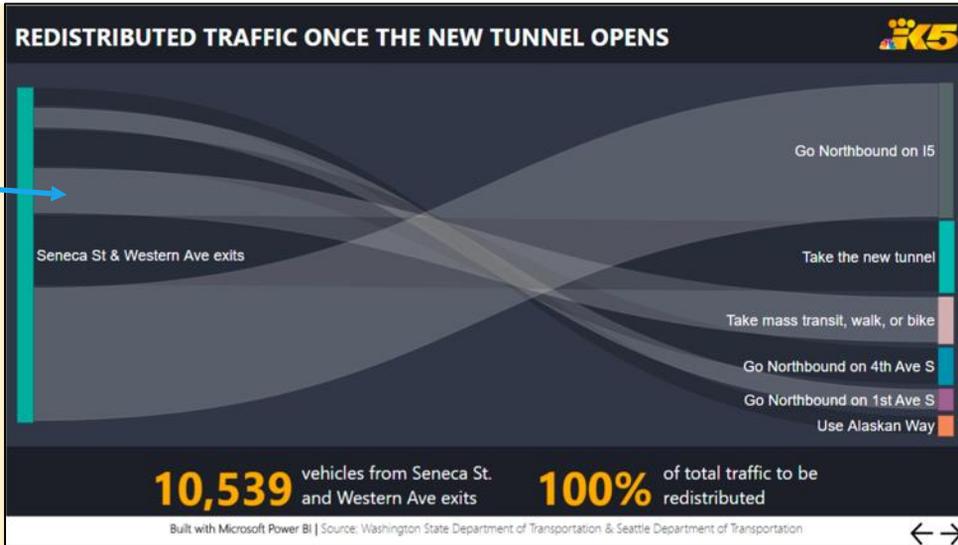


# Storyboard and data visualization



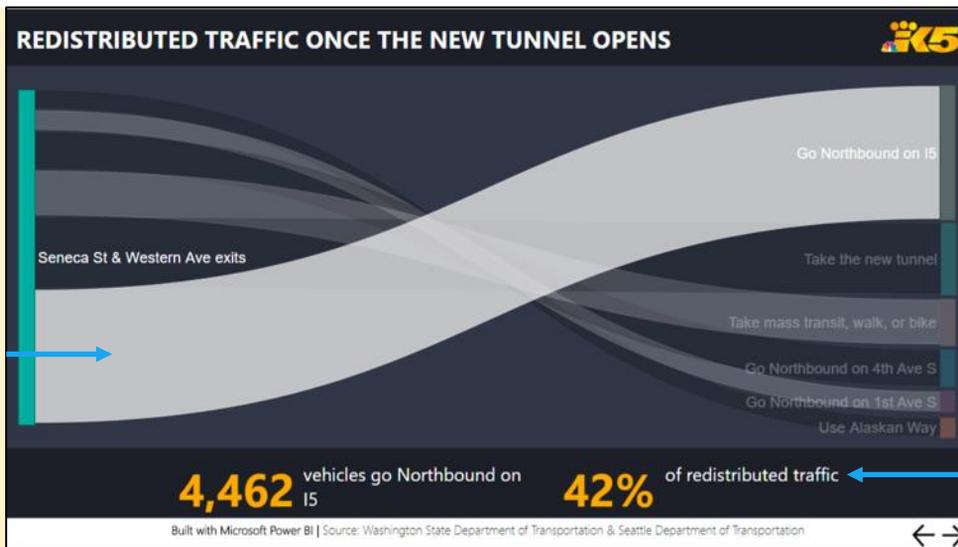
To show how traffic flows changed once the tunnel was open and the viaduct was closed, the team used a “Sankey diagram” as the main visualization on the second page of the story:

Sankey Diagram



Note how clicking on a route segment dynamically changes the Enlighten Data Story visual text:

When the route is clicked



The text dynamically changes.

These design choices made the story easy for readers to interact with even if they do not have prior knowledge of analytics tools. When in doubt, choose visuals that are approachable rather than flashy.



# Storyboard and data visualization



## Using pages

Breaking down your story into pages is an effective technique to unfold the major steps, or chapters, of your story, particularly for broadcast.

To drive interaction for a web audience and make your data visualizations more approachable, try these tips:

- Use buttons with bookmarks to create simple navigation for users to traverse your data visualization.
- Prompt your audience to interact with the visualizations with your headline, text, and visual cues.
- Include features that allow the audience to explore the data and generate new insights.
- As the web visuals will not have live TV voiceover, include supporting text where needed.

For example, on the KING 5 immunization story, the team included the following key features on the visuals:

**Washington Kindergarten Immunization Rates**  
Who meets the state's 95 percent completion target?

Schools **At Or Above Target**  
258

Schools **Below Target**  
1177

**Why 95 Percent?**  
Gov. Jay Inslee, along with public health experts, set a school goal of kindergarten vaccination coverage at 95 percent because at that rate, we can prevent the spread of most diseases to others and protect those who cannot get vaccinated.

Hover over the map to explore district completion rates.

← Call out prompt

→ Navigation Buttons

Supporting text

Legend: ● Below 95% | ● At or above 95% | ● No reported data or kindergarten enrollment

Sources: Washington State Department of Health, National Institute of Allergy and Infectious Disease  
Built with Microsoft Power BI

**Kindergarten Immunization Rates At Your Child's School**

School Year: All | School District: All | School Name: Search

Percent Complete Immunizations: 0.00% | 100.00%

School District	School Name	Reported enrollment	Students with all vaccines complete	Students with exemptions
Sunnyside	Sun Valley Elementary	548	97.26%	0.36%
Sunnyside	Sun Valley Elementary	522	97.51%	0.77%
Pasco	Captain Gray Early Learning Center	513	97.86%	0.97%
Pasco	Captain Gray Early Learning Center	507	97.44%	1.38%
Sunnyside	Sun Valley Elementary	490	98.98%	0.41%
Mukilteo	Pathfinder Kindergarten Center	483	85.09%	3.52%
Sunnyside	Sun Valley Elementary	474	98.31%	0.84%
Sunnyside	Sun Valley Elementary	461	99.35%	0.22%
Northshore	Frank Love Elementary	329	88.15%	4.56%
Fife	Discovery Primary School	300	88.67%	8.00%

Legend: ● 0-20% | ● 20%-40% | ● 40%-60% | ● 60%-80% | ● 80%-95% | ● 95%-100%

Interactive Pages

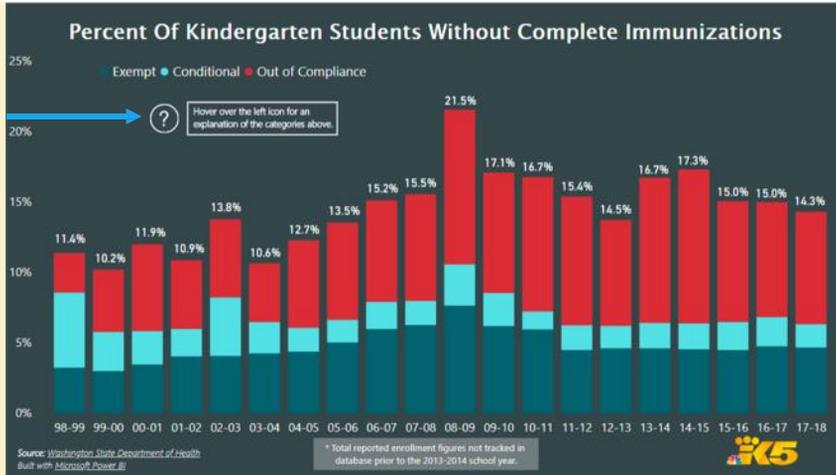
Sources: Washington State Department of Health  
Built with Microsoft Power BI



# Storyboard and data visualization



Callout prompt



If you prefer to publish each page of your report as a separate asset, simply save and publish embed codes of each page of your Power BI reports separately. This allows you to write out your story in text and bring in your visualizations as it unfolds in written words. On the KING 5 immunization story, reporter Taylor Mirfendereski decided this would be the best way to tell the story. For example:

**Why don't all students get their shots?**

Vaccinations are required for school-aged children, but state law allows parents to exempt their kids from some or all vaccines for personal, religious-related or medical reasons.

Nearly 5 percent of Washington kindergarten students had exemptions in the 2017-2018 school year, according to the Department of Health data. Nearly 8 percent of the state's kindergarten students were labeled as out of compliance for not turning in paperwork to show proof of vaccinations or an exemption.

"The majority of people believe vaccinations are necessary, but there is a small percentage of people who are very vocal, very well-funded and organized that are anti-vaccines," said Drew Peterson, associate director for immunization programs at the Immunization Action Coalition.

**Interactive: Percent of Kindergarten Students Without Complete Immunizations**

Microsoft Power BI

State law requires local school officials to exclude out-of-compliance students — with the exception of students who are homeschooled — from class until they get their vaccines or produce a certificate of exemption. Currently, no state agency tracks whether or not the state's school districts are following through with this requirement.

"DOH's focus in increasing school immunization completion rates is to work with schools and administrators to reduce the number of out-of-compliance students," said Kwaning, the immunization program supervisor. "This will help us get a more accurate picture of how well our schools and students are protected in case of an outbreak."

**RELATED: These 15 U.S. cities are hotspots for kids not getting vaccines**

Washington's exemption rate steadily crept upward until 2009. At the time, Washington had one of the most lenient exemption policies in the nation, which allowed parents to simply submit the form without consulting a physician. Experts say it led to parents to choose an exemption for their child out of convenience or because of rumors they'd hear on a television talk show.

"It shouldn't be easier to get your child into school without their vaccinations than it is to get them in with their vaccinations," Peterson said.

**Interactive: Washington's Kindergarten Students With Exemptions (By Type)**

Washington's Kindergarten Students With Exemptions

Year	Medical (%)	Religious (%)	Personal (%)
2009	14.4%	10.2%	18.7%
2010	14.4%	10.2%	18.7%
2011	11.6%	12.1%	17.1%
2012	11.6%	12.1%	17.1%
2013	11.6%	12.1%	17.1%
2014	11.6%	12.1%	17.1%
2015	11.6%	12.1%	17.1%
2016	11.6%	12.1%	17.1%
2017	11.6%	12.1%	17.1%
2018	11.6%	12.1%	17.1%

Keep in mind, however, that including multiple iframes on your page can slow down page load times. One way to improve page load times is to ensure each visualization file is saved separately to only include the pages needed at that stage of the story. This way, when the page loads, if you have five visualizations in your story, the page only loads five data visualization pages worth of data, as opposed to 25 pages worth of data.



# Storyboard and data visualization



## Commonly used visuals in data journalism

Some of the commonly used visuals used in Power BI for data journalism that you should familiarize yourself with are:

- Clustered bar chart
- Line chart
- Area chart
- Stacked bar chart
- Pie chart
- Tree map
- Filled map
- Table
- Card
- Slicer
- Chiclet Slicer
- Enlighten Data Story
- Sankey diagram
- Maps



## Learning resources

### From Data to Viz

An excellent resource to help you choose the best graph or visual for your data.

<https://www.data-to-viz.com/>

### Data visualization catalog

This handy site will help you select a chart based on your communication needs.

<https://datavizcatalogue.com/search.html>

### Gestalt Principles

Understand how humans typically see objects to design more engaging visualizations.

<https://www.interaction-design.org/literature/topics/gestalt-principles>

### Gain efficiency with report themes

Creating predefined report themes and color palette in Power BI can help you reduce the cycle time of creating and refining data visualizations.

<https://docs.microsoft.com/en-us/power-bi/desktop-report-themes>

### The Functional Art

Alberto Cairo's blog on visualization, infographics, and data journalism.

<http://www.thefunctionalart.com>

### Steve Haroz's research

Steve studies how the human brain perceives and understands visually displayed information.

<http://steveharoz.com/research/>

### Cultural blind spots

Read up on cultural blind spots in UX.

<https://medium.com/nasdaq-design/cultural-blind-spots-in-ux-840353aa3cdd>

### Using Maps in Power BI

Maps are a common way to visualize data. Find out about options in Power BI.

<https://docs.microsoft.com/en-us/power-bi/guided-learning/visualizations?tutorial-step=5#step-0>



# Data visualization refinement



At this point of the data journalism process, you have achieved a lot and you are in the final stages of story development. By now, you should have your storyboard solidified, along with the draft data visualizations to tell the complete story. Data visualization refinement can be an intensive step but with the help of report templates, visual design guidelines, predefined color palettes, iconography repositories and stock photography, cycle time for this step can be dramatically reduced, improving overall efficiency.

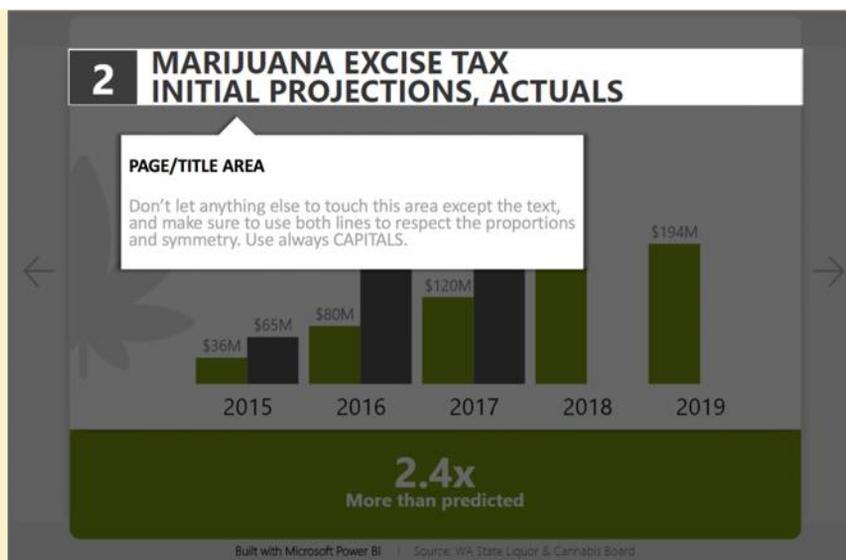
Your data visualization should already employ interactive design and approachable visuals that prompt users to click through slicers of common dimensions and move through pages using familiar web navigation principles. Now, focus on defining the identity of your data visualization and making every page conform to the same style.

## Report on canvas areas

The primary areas of the report canvas should be broken up into the page/title area, insight area, call-out area, navigation area and important notes.

These should be in the same place on every page of your data visualization.

The page/title area should be on the top as a header and can be one to two lines. Do not let anything else touch this area and make sure to use both lines to respect the proportions and symmetry. Capital letters in the page/title area add impact.

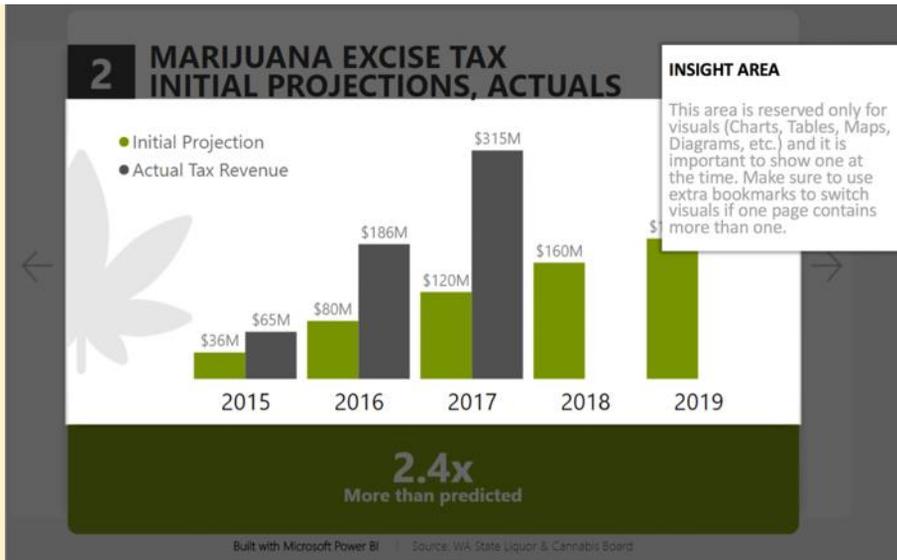




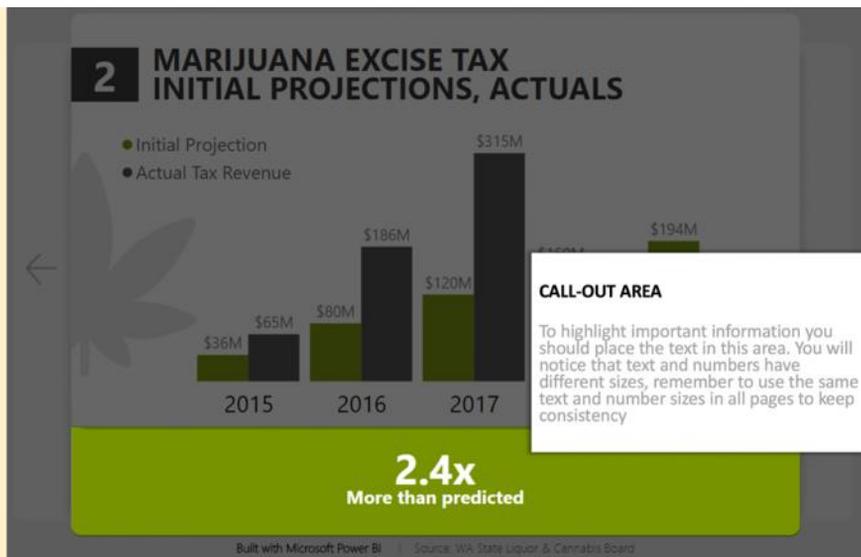
# Data visualization refinement



The insight area is below the title area and takes up most of the report canvas' real estate. This area is reserved only for visuals (charts, tables, maps, diagrams, etc.). Show only one at a time. Consider Miller's Law. Use extra bookmarks to switch visuals if one page contains more than one.



The call-out area, ideally located below the insight area, highlights valuable information. Consider using an Enlighten Data Story visual to call out key details: Have the text and numbers be varied sizes, bolding, and increasing the size of the numbers. That said, remember to use the same text and number sizes in all pages to keep consistency.

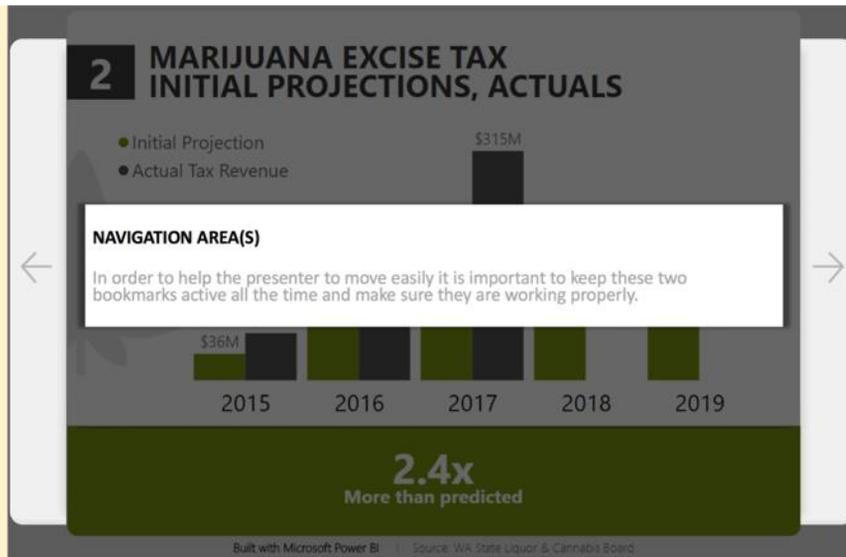




# Data visualization refinement



The navigation area can be on the bottom or either side of the report canvas. Utilize buttons with arrow icons to increase familiarity and consider where you will be standing if you are using the report on air to ensure you can easily navigate between pages without blocking the information.



Notice that all screenshots provided from the KING 5 pilot stories followed this same template, even though their subject matter varied widely. By leveraging a repeatable template, you can be more effective in building your brand, as well as reduce cycle time on building professional data visualizations that provide clarity and consistency.

Adding icons, legends, indicators, and other small elements in your pages will level up the quality of your data visualizations and create an individualized touch.

Do not be afraid to add extra elements to emphasize your message but be careful not to oversaturate your pages. Remember, less is more. As a rule, use no more than two fonts and no more than three colors (or tight groups of colors if you are skilled in defining color palettes), within a given data visualization. Colors, and in particular images or icons, should be used to convey or highlight information, not as decoration, as this has been shown to decrease how memorable and impactful data visualization can be.

As noted in an earlier section, provide meaningful comparisons in the form of ratios or percentages whenever possible.



# Data visualization refinement



## Design checklist

You can use the following design checklist to help guide the final refinement of your story.

### Layout

Is the design consistent? For example, are elements in a consistent order, of a consistent size, and grouped logically to align to the template?

Do all relevant items appear?

### Typography

Do your visualizations adhere to typography visual design guidelines?

Is your typography consistent and limited to no more than two fonts and three colors?

Is the hierarchy of the information presented clear?

Does your text have enough contrast, particularly in your call-out areas?

Do you employ effective use of line height and paragraph spacing?

### Color

Does your palette provide sufficient contrast to make content accessible?

Do you use no more than three colors (or tight groups of colors), based on an existing color palette aligned to your organization's branding guidelines?

### Interaction

Is there a clear call to action to engage with the content — i.e., will the reader know it is interactive and which sections to click on? Use words, icons, or both to encourage engagement.

Are interaction elements like buttons and slicers obvious, and are the relationships clear?

Is the overall navigation easy to understand and use?

If there is more than one page, is the navigation to the second page clear?



# Data visualization refinement



## Surface Hub and checks for live TV

Have you screen-tested the data visualizations in the studio using a TV camera and validated the TV audience will see your visuals as intended? Be sure to check that the visuals show up as expected.

Is all text readable on the control room TV from across the room?

Do your navigation area buttons work as expected on the Surface Hub, and can you reach them without stepping in front of the screen?

Is there enough contrast in your chosen color palette so that no visual or text is washed-out?

Is your station's logo in a place on every page of your visual that will not interfere or look odd when the station logo in the live TV watermark is used?

Have you validated upon publishing that all your visuals render as expected? If not, you may need to adjust the position and size of some visuals in the web version of Power BI and save before airing.

## Checks for publishing to the web

If you are using multiple data visualizations in your web story, to speed up performance when the page loads, have you made sure that the data visualizations only include the necessary pages?

After publishing, check that all your visuals render as expected. If not, you may need to adjust the position and size of some visuals in the web version of Power BI and save before publishing.

Have you remembered to save the visualization on the page you want to start from before publishing?

Have you used the [Optimization Tool](#) to ensure the report will adjust across device sizes.



# Data visualization refinement



## General

Have you followed the AP Stylebook data journalism guidelines, or other industry standards?

If the report were shared without the page content, is the headline and story clear?

Are the page titles relevant and clear?

Have you checked for spelling, grammatical errors and general tidiness?

Are you using correct logos and conforming to brand guidelines?

Do you remember to include info about the data sources and your supporting methodology?



## Learning resources

### The Color Oracle

Use this color-blindness simulator for all platforms.

<http://colororacle.org>

### Color Palette

ColourLovers is a creative community where people from around the world create and share colors, palettes and patterns.

<https://www.colourlovers.com/>

### Iconography

Over one million icons, free for use with attribution.

<https://www.flaticon.com>

### Fonts free for commercial use

<https://www.fontsquirrel.com>





# Publishing and sharing



## Publishing steps and live television considerations

Publishing in Power BI is easy.

In Power BI Desktop, simply click the Publish button in the top ribbon, and select the Workspace you would like to publish to. Then navigate to Power BI in your browser, find and open your report in the Workspace you published it to, and click Publish to Web. You can select the size of your report in this step and use the HTML code to embed your visualizations into your story on your blog or website. When sized correctly, your report should fill the iframe without any gray borders.

Publishing your Power BI report for the web? Lukasz Pawlowski's tool can help. Simply copy your Power BI embed URL into the tool, and click to optimize. <https://lukaszpawlowski-ms.github.io/Optimize-Publish-To-Web/>

If you plan to air your Power BI data visualizations on live television in addition to publishing online, particularly using a Surface Hub while a camera films you using the touchscreen interface, do a dry run in the studio and validate that all visualizations show up as expected in the control room. When a camera films a screen, visuals with higher levels of brightness tend not to show up with the same contrast as they do on a monitor. In extreme cases, visuals do not appear at all. Doing a dry run can help prevent unwanted on-air distractions. Please refer to the Design Checklist to consider all design decisions prior to airing on TV and publishing.



## Learning resources

### Publish to web with Power BI

Follow detailed instructions about how to publish your report to the web.

<https://docs.microsoft.com/en-us/power-bi/service-publish-to-web>

### Optimize your report

Use this handy tool to make sure your report fits to the iframe and page size.

<https://lukaszpawlowski-ms.github.io/Optimize-Publish-To-Web>

# Appendix

The learning resources included in each section are presented here for easy reference.

Go to [aka.ms/datajournalism](https://aka.ms/datajournalism) or visit [community.powerbi.com](https://community.powerbi.com) for more resources.

## Data journalism

The **Data Journalism Handbook** is used by students, researchers and practitioners learning about the state of the ever-evolving field of data journalism.

<https://datajournalismhandbook.org/handbook/two#introduction>

**DataJournalism.com** is a project of the European Journalism Centre (EJC), offering access to resources, handbooks, discussions and more. [www.datajournalism.org](https://www.datajournalism.org).

**Investigative Reporters and Editors (IRE)** is a nonprofit organization that offers resources, conferences and specializing training, including the Computer Assisted Reporting conference for data journalists. [www.ire.org](https://www.ire.org)

## Technology

**Learn more about Excel**  
Visit the Excel help center to find training, support, and news. <https://support.office.com/en-us/excel>

**Power BI in the news**  
See how other journalists are using Power BI for data stories. <https://microsoft.baa.nz/>

### Power BI for Data Journalism

To get deeper into the tool and become more self-sufficient, set aside approximately two hours to walk through the Data Power BI data journalism onboarding tutorial on Microsoft's website.

<https://powerbi.microsoft.com/en-us/datajournalism/>

### Power BI Guided Learning

Follow the on-demand learning guides.

<https://docs.microsoft.com/en-us/power-bi/guided-learning/>

### Power BI Community

Share ideas, get support and submit feature requests and engage with other data enthusiasts in the community.

<https://community.powerbi.com/>



## Idea and hypothesis generation

### Women in DataViz Twitter list

Follow this open, evolving Twitter list of the female talent working with, studying, and making dataviz.

<https://twitter.com/sarahslo/lists/women-in-dataviz>

### NYT Graphics Twitter

Keep up to date on data visualization in journalism by following one of the industry leaders.

<https://twitter.com/nytgraphics>



## Data gathering

### Associated Press Stylebook

The AP Stylebook includes a chapter on data journalism.

<https://www.apstylebook.com>

## Getting and cleaning data in Power BI

Guided learning on getting data.

<https://docs.microsoft.com/en-us/power-bi/guided-learning/gettingdata>

## Excel Get & Transform and PowerPivot

Master these powerful features.

<https://support.office.com/en-us/article/Get-Transform-and-Power-Pivot-in-Excel-42D895C2-D1D7-41D0-88DA-D1ED7ECC102D>

## Freedom of Information Act Request

To learn how to submit a Freedom of Information Act request, visit.

<https://www.foia.gov>

See sample FOIA request letters at

<https://www.nfoic.org/sample-foia-request-letters>



## Data cleaning

### Top 10 ways to clean your data in Excel

Microsoft's top 10 ways to clean your data in Excel will have you moving fast in no time.

<https://support.office.com/en-us/article/Top-ten-ways-to-clean-your-data-2844B620-677C-47A7-AC3E-C2E157D1DB19>

### Power Query

Power Query, (also known as Get & Transform) provides an intuitive and consistent experience for discovering, combining, and refining data across a wide variety of sources in Excel and Power BI.

<https://support.office.com/en-us/article/get-transform-in-excel-881c63c6-37c5-4ca2-b616-59e18d75b4de>



## Importing and modeling

### Power BI guided learning

Microsoft Power BI provides guided learning on modeling data, visualizations, and much more. <https://docs.microsoft.com/en-us/power-bi/guided-learning/>

### Create a data model in Excel

Follow the steps to integrate a table from multiple tables.

<https://support.office.com/en-us/article/Create-a-Data-Model-in-Excel-87E7A54C-87DC-488E-9410-5C75DBC0F7B>



## Data exploration

### edX Course

This free 6-week training course provides advanced training on analyzing and visualization data in Excel.

<https://www.edx.org/course/analyzing-and-visualizing-data-with-excel-2>



## Storyboard and data visualization

### From Data to Viz

An excellent resource to help you choose the best graph or visual for your data.

<https://www.data-to-viz.com/>

### Data visualization catalog

This handy site will help you select a chart based on your communication needs.

<https://datavizcatalogue.com/search.html>

### Gestalt Principles

Understand how humans typically see objects to design more engaging visualizations.

<https://www.interaction-design.org/literature/topics/gestalt-principles>

### Gain efficiency with report themes

Creating predefined report themes and color palette in Power BI can help you reduce the cycle time of creating and refining data visualizations.

<https://docs.microsoft.com/en-us/power-bi/desktop-report-themes>

### The Functional Art

Alberto Cairo's blog on visualization, infographics, and data journalism.

<http://www.thefunctionalart.com>

### Steve Haroz's research

Steve studies how the human brain perceives and understands visually displayed information.

<http://steveharoz.com/research/>

### Cultural blind spots

Read up on cultural blind spots in UX.

<https://medium.com/nasdaq-design/cultural-blind-spots-in-ux-840353aa3cdd>



## Data visualization refinement

### The Color Oracle

Use this color-blindness simulator for all platforms.

<http://colororacle.org>

### Color Palette

The ColourLovers is a creative community where people from around the world create and share colors, palettes, and patterns.

<https://www.colourlovers.com/>

### Iconography

Over one million icons, free for use with attribution.

<https://www.flaticon.com>

### Fonts free for commercial use

<https://www.fontsquirrel.com>



## Publishing and sharing

### Publish to web with Power BI

Follow detailed instructions about how to publish your report to the web.

<https://docs.microsoft.com/en-us/power-bi/service-publish-to-web>

### Optimize your report

Use this handy tool to make sure your report fits to the iframe and page size.

<https://lukaszpawlowski-ms.github.io/Optimize-Publish-To-Web/#i>

## Understanding and preventing bias

There are many different biases that can affect the impartiality of a story at every stage, from data gathering to modeling to visualization. It is our responsibility to be aware of and avoid these biases.

### Confirmation bias

The purpose of data analysis is to explore the data you have gathered, prove, or disprove your hypothesis and potentially find new insights you have not yet imagined. Confirmation bias is a departure from this spirit, and instead seeks information that only supports the hypothesis. In gathering data, be sure to find all data necessary and available to fully represent the reality of your situation and be careful not to avoid data you deem irrelevant, when in truth it might disprove your hypothesis.

### Availability bias

Closely related to confirmation bias, availability bias refers to only sourcing the data that is readily available to you. Be prepared to dig for data, work with partners, and be tenacious in pursuit of the truth.

### Selection or sampling bias

This bias refers to the data being collected from a sample of the population that is not representative of the entire population. For example, if your story idea is to show how insurance premiums for drivers have increased over time, but your sample is limited to drivers between 16 and 25 years of age, your data would suffer from sampling bias.

## Cherry-picking

In cherry-picking, the question is phrased in a way to get the preferred answer. This is different from confirmation bias, where the answers have already been gathered, but only the answers that support the hypothesis are retained.

### Cultural bias

This bias refers to the impulse to use familiar phrases, idioms, colors, and graphics, without first considering that members of your audience may be of diverse cultures, who can sometimes have vastly different interpretations of these elements.

### Biased language

Already extremely familiar to traditional journalists, biased language refers to using language that expresses preference towards a perspective or series of perspectives potentially to the exclusion of other concepts. This may involve using charged words or otherwise degrading the principle of impartiality.

### Issue bias

In data journalism, issue bias refers to manipulation of how the data was surveyed or gathered, or directly tampering the data or analysis in a way that intentionally shifts debates or perspectives in a specific direction in a non-transparent way.

## Technical bias

Meet your audience where they are. Put yourself into their shoes and make your work as approachable as possible, as opposed to using the most complex or high-tech visualizations because they are interesting to you. With data journalism, the opportunity exists to communicate complex insights to wide audiences. However, we must be careful that the data visualizations are approachable to a wide audience and easily understood, and do not favor the more tech-fluent sections of society.

## Biased data narrative

In this bias, the narrative of a story is formulated by choosing which data to visualize or using visualizations in a manner that pushes a specific issue or agenda. To help prevent a biased data narrative, share your methodology and seek feedback from external users and your audience.

## Replication bias

Typically, replication refers to the ability to reproduce the results of the analysis using other data samples from the population the initial sample was drawn from. Replication ensures the validity and reliability of the data analysis.

## The Hawthorne Effect

This bias is most practically applied in data journalism if you are collecting data yourself or conducting surveys yourself. The Hawthorne Effect is the phenomena that people change their behavior when they know they are being watched or observed. To avoid it,

researchers often begin their observations and only begin recording data once a period has elapsed and it is believed that the subjects' behavior has returned to normal.

## Miller's Law

A person's short-term memory can only store five to nine units of information at a time; this, for instance, is why telephone numbers have been limited to seven digits. Thus, it is best to automate the collection of data wherever possible and design your data visualizations to present no more than five to nine insights at a time.





© 2018 Microsoft Corporation. All rights reserved. This document is provided as is.. Information and views expressed in this document, including URL and other internet website references, may change without notice. You bear the risk of using it.

This document does not provide you with any legal rights to any intellectual property in any Microsoft product. You may copy and use this document for your internal reference purposes.

LAST UPDATED JULY 2021. Questions? [Go](https://aka.ms/datajournalism) to [aka.ms/datajournalism](https://aka.ms/datajournalism)