



DASHBOARDS:

**Topics in Design, Evaluation, and
Maintenance for Effective Insights of
Drug Overdose Surveillance**

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BACKGROUND

Data visualizations using dashboards have become a frequently sought-after tool in recent years across public health sectors as evidenced by the growing number of CSTE members and partners interested in developing and utilizing these tools.

This resource was developed in response to members of the Council of State and Territorial Epidemiologists (CSTE) working in drug overdose surveillance expressing a need to understand how to develop and maintain these complex data dissemination conduits. These tools appeal to public health teams because they can streamline the burden on public health practitioners to prepare and communicate data to various stakeholders seeking to understand drug overdose surveillance trends with updated, easily interpreted data displays.

The nature of drug overdose surveillance data present unique challenges when using these data visualization tools. The

types of data required to build a complete picture of the burden of drug overdoses for any given jurisdiction include behavioral health, hospital data, corrections data, medical examiner reports, all of which generally have strict regulations regarding sharing between agencies or broadly with the many stakeholder groups who seek these data such as the media and community coalitions.

Dashboard development is challenging in public health settings due to the variety of skills required to successfully execute these projects. Public health teams possess extensive knowledge of public health data reporting mechanisms, analytics, and data governance; however, they are not often well-versed in the principles of data engineering and data visualization. This critical skill is needed to carefully curate these dashboard tools to ensure that users from all backgrounds draw accurate conclusions from the data presented. To successfully build dashboards, public health teams must possess a basic understanding of principles in public health data systems, data engineering, and data visualization. In instances when this knowledge is not possessed, many teams are unable to complete their projects or they must identify non-traditional public health contacts in their jurisdiction who understand these principles and recruit them to the dashboard development team.

While the structure of a dashboard development team may vary in jurisdictions, some key concepts must be

understood and executed to effectively display any kind of data on these interactive tools. This resource will outline the key principles of data visualization, data preparation, data governance and evaluation that must be considered during dashboard development.

This resource presents several important concepts pertaining to the development, use, and long term maintenance of dashboards especially for public health and overdose surveillance.

To supplement the guidance in this resource, a complementary workbook and videos have been developed to walk through the technical aspects of dashboard development.

DATA PREPARATION

PREPARING DATA FOR PUBLIC USE

Data dashboard teams developing content that will be available for the public will need to make additional data considerations and carefully select the data sources used. Many data sources commonly used to identify overdoses (nonfatal and fatal) have strict regulations regarding how they may be shared. Additionally, these data sources may be prone to delays in availability.



CONSIDER THE FOLLOWING QUESTIONS WHEN SELECTING A DATASET FOR PUBLIC USE:

- What is the quality of the data?
- What data is available?
- What restrictions, if any, exist for sharing the data?
- What variables are available? How were they defined?
- How were variables measured? What analysis can I use?
- When was the data collected?
- From whom and where was data collected?
- What was the original purpose of collecting the data?
- How often can updated data be accessed?

EXAMPLE DATASETS COMMONLY USED IN DRUG OVERDOSE DASHBOARDS:

- DEATH CERTIFICATE DATA
- CORONER/MEDICAL EXAMINER REPORTS
- EMERGENCY DEPARTMENT/HOSPITAL DISCHARGE
- SYNDROMIC SURVEILLANCE

Mortality data such as death certificate data or Coroner/Medical examiner reports often show the most common causes of death for fatal overdoses. These data can tell a story of

relative impacts of various types of fatal overdoses and describe the impact across time, age groups, and gender. Standardized reporting of these data sources enables identifying trends over time and allows some comparisons between jurisdictions at local, county and national levels. Some limitations include timeliness, under-reporting of overdose attributed deaths, lack of drug specificity on death certificates, and lack of specific ICD-10 codes for certain drugs.

EXAMPLE DATA SETS FROM WASHINGTON AND VIRGINIA PROVIDED BELOW:

- [WASHINGTON STATE DEATH DATA](#)
- [CALIFORNIA STATE DEATH DATA](#)

Health data from **Emergency Departments (EDs)** as well as **hospital discharge data** is used for public health surveillance. In particular, ED visit data can be used to identify both nonfatal and fatal overdoses. The data includes attributes such as number of visits, expected payer, discharge disposition, age, principal diagnosis groups, and principal external cause of injury/morbidity groups. These datasets will include valuable ICD-10-CM codes for these attributes.

EXAMPLE DATA SETS FROM CALIFORNIA AND VIRGINIA PROVIDED BELOW:

- [HOSPITAL EMERGENCY DEPARTMENT DATA](#)
- [VIRGINIA EMERGENCY DEPARTMENT VISITS](#)

Syndromic surveillance provides an early alert for health events by tracking symptoms or conditions such as decreased respirations, constricted pupils before an overdose diagnosis is made. These alerts are made possible because data collection happens when patients are in the emergency department and information is tracked in real time. Syndromic surveillance allows for rapid identification of possible outbreaks and can be used to provide community awareness. Syndromic surveillance data can include several attributes including but not limited to over-the-counter and prescription medication sales, reports to poison control, and Emergency Medical Service ambulance data, to name a few. Limitations include data captured pre-diagnosis with inconsistent validation methods as well as variation in signal detection methods. While each jurisdiction manages their syndromic surveillance system, this data source is constantly being improved through participation in the National Syndromic Surveillance Program (NSSP), which is a collaboration between the Centers for Disease Control and Prevention (CDC), local and state health departments and various partners.

MORE INFORMATION CAN BE FOUND IN THE NSSP KNOWLEDGE REPOSITORY:

- [NATIONAL SYNDROMIC SURVEILLANCE PROGRAM](#)

FILE FORMATS FOR STORING AND DISSEMINATING PUBLIC DATA

Public data or open data can be offered and disseminated in a variety of formats. Data formats can either be “open” or “closed”. An open format is one where the data can be read by anyone using software or tools that are freely and publicly available. The benefit of open file formats is that they permit developers to produce multiple software packages and services using these formats. This minimizes the obstacles to reusing the information they contain. Closed file formats are proprietary formats that require special software to access. Most importantly, the format of an open dataset should be structured to be used by both humans and machines. Consider how the data will be managed and reused while choosing data formats for your public data.

BEST PRACTICES FOR CHOOSING A FILE FORMAT

- ✔ Data for public release must be in open, non-proprietary, and machine-readable formats
- ✔ Release data in multiple formats if the format used by the scientific community does not meet all of these requirements
- ✔ Select formats that have broad use and support in your community
- ✔ Be aware of software requirements for viewing and working with the data
- ✔ When possible, choose formats that are self-describing and can automatically capture metadata
- ✔ Use uncompressed formats
- ✔ Use standard character encodings (ASCII, UTF-8)
- ✔ If sharing different formats of the same file, be sure to name each file with the same name (e.g. bison_data_v1.xlsx and bison_data_v1.txt).

Choosing the right format helps ensure the data can be simply managed and reused.

BELOW, WE DISCUSS COMMONLY USED FORMATS FOR PUBLIC DATA:

JSON: JSON is an open standard file format for sharing data that uses human-readable text to store and transmit data.

XML: XML is a markup language and file format for storing, reconstructing arbitrary data. It defines a set of rules for encoding documents in a format that is both human-readable and machine-readable.

RDF: RDF is recommended by W3C to represent data in a form that makes it easier to combine data from multiple sources. RDF data can be stored in XML and JSON.

SPREADSHEETS: Spreadsheets such as Excel sheets are commonly used because of ease of use. These files contain cells in rows and columns and can help arrange, calculate and sort data. Avoid using macros and formulas in the cells and opt for precalculating all values before distributing the data.

COMMA SEPARATED FILES (CSV): CSV files are columns of data separated by a comma are a useful format because of their compactness. They are suitable for transferring large files. The file format does not lend descriptiveness to what data is contained in the columns so it should be accompanied by proper documentation.

PLAIN TEXT: Plain text documents (.txt) are very easy for computers to read. Some problems can be caused by switching plain text files between operating systems. MS Windows, Mac OS X and other Unix variants have their own way of telling the computer that they have reached the end of the line.

REGULATIONS FOR SENSITIVE DATA

Sensitive data is data that would result in adverse effects for living individuals or may have significant economic implications if made public. This data is often classified information that must be protected against unauthorized access and is not amenable for public use. Unlike information such as a person's name, email or address which is considered personal data, sensitive data is subject to greater protection. = Several types of sensitive data can be used for analytics and presented via dashboards when data is aggregated suitably or through the use of de-identification or anonymization steps. De-identification removes personally identifiable information and might use transformations to mask or obscure sensitive information. Aggregation alters the level of detail in the data by presenting data at higher levels in order to avoid personal identifiability.

Sensitive information is typically bound by privacy and dissemination laws such as General Data Protection Regulation (GDPR), California Consumer Privacy Act (CCPA) or The Health Insurance Portability and Accountability Act (HIPAA). It is recommended that dashboard development teams understand the data compliance and privacy laws at the state or federal law when sensitive data is involved. Alternate dissemination methods or adjusted data stratifications of sensitized data might be necessary once the appropriate compliance laws are consulted.



THE FOLLOWING DATA TYPES ARE ALSO CONSIDERED TO BE SENSITIVE:

- Data revealing racial or ethnic origin, political opinions, religious or philosophical beliefs
- Data that reveals trade-union membership
- Genetic and biometric data used to identify an individual
- Medical and health-related data
- Data pertaining to a person's sex life or sexual orientation

Several types of sensitive data can be used for analytics and presented via dashboards when data is aggregated suitably or through the use of de-identification or anonymization steps. De-identification removes personally identifiable information and might use transformations to mask or obscure sensitive information. Aggregation alters the level of detail in the data by presenting data at higher levels in order to avoid personal identifiability.

In some instances, data may not be reported at all, called suppression. This occurs when only a few cases exist. The threshold for suppression guidelines is set by each jurisdiction or state. Limited numbers of individual cases cannot reliably be deidentified even when aggregated and will be suppressed in order to protect those individuals from possible identification. The existing suppression rules outlining allowable data reporting, may not allow a dashboard to show all desired data stratifications. For instance, race and ethnicity data may not meet the suppression threshold and may not be displayed, especially in a smaller community. This may be avoided if an alternate stratification or data reporting timeframe is used such as reporting annual cases rather than monthly cases.

DOCUMENTATION AND METADATA OF DATA FOR THE PUBLIC

Data documentation will enable users to understand and interpret the data. Documentation explains how the data was created, the context, structure, and content. It is important to document the context and objective of data collection along with methods used for data collection. The structure and organization of files in the data need to be thoroughly described. *At the data level, document* variable names and descriptions, definitions of

codes/acronyms used in the data, any algorithms used to transform/manipulate data, and the file format descriptions.

BELOW ARE KEY DESCRIPTORS TO INCLUDE IN THE DATA DOCUMENTATION:

TITLE: Name of the dataset or research project that produced it

- Creator Names and addresses of the organization or people who created the data

DATES: Key dates associated with the data, including project start and end date, data modification data release date, and time period covered by the data

SUBJECT: Keywords or phrases describing the subject or content of the data

FUNDERS: Organizations or agencies who funded the research

RIGHTS: Any known intellectual property rights held for the data

LANGUAGE: Language(s) of the intellectual content of the resource, when applicable

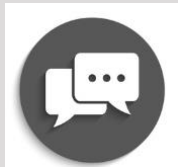
METHODOLOGY: How the data was generated, including equipment or software used, experimental protocol

DATA SUPPRESSION RULES: Methods or restrictions applied to specific parts of the dataset with limited data to avoid disclosure of information about individuals or to ensure statistical reliability of downstream analyses.

DATA LIMITATIONS: Addresses limitations of the data, what the data cannot be used for, and aspects not covered by the data.

Metadata provides information about the origin, purpose, time, geographic location, creator, access, and terms of use of the data. Metadata is structured reference data that helps to sort and identify attributes of the information it describes. Metadata summarizes basic information about data, which can make it easier to find, use and reuse particular instances of data. Metadata is important because it allows you to organize data in a way that is meaningful to you and makes it easier to find the information you are looking for. It

also helps to keep your data consistent and accurate. When creating metadata, a best practice is to use controlled vocabulary, standard terminology for your discipline. Using an accepted standard, controlled vocabulary or an authority list will help in the retrieving and indexing of your data. Spreadsheets, CSV or tab-delimited (TSV) files are good choices for storing metadata. There are several metadata standards – we discuss a few general standards below:



DUBLIN CORE – The Dublin Core standard is widely used and is domain agnostic.

DDI (Data Documentation Initiative) – DDI is commonly used for social, behavioral sciences, including survey data.

CONSIDER THE FOLLOWING BEST PRACTICES AS YOU CREATE METADATA FOR YOUR DATASET

- ✓ Create a data dictionary: A data dictionary provides insight and description for each variable in your dataset. Data dictionaries are used to document important and useful information such as a descriptive name, the data type, allowed values, units, and text description.

- ✓ Create, manage, and document your data storage system: Data sets that contain a large number of files can become unusable and difficult to understand without a well-organized structure. Organize files logically to represent the structure of the research/data. Include human readable "readme" files at critical levels of the directory tree. A "readme" file might include such things as explanations of naming conventions and how the structure of the directory relates to the structure of the data.

- ✓ Describe the contents of data files: Include descriptions for contents of each file. Define any parameters and units for all variables. Describe formats for dates, time, and other necessary attributes.

- ✓ Maintain consistent data typing: Choose the right data type and precision for data in each column. For example, use date fields for dates and use numerical fields.

DATA PREPARATION

DATA HARMONIZATION

Data harmonization is the series of steps undertaken to combine data from different sources so that users can gather insights from data across different sources. This harmonization step can involve bringing together data from different formats and conventions to create a cohesive dataset. These steps are crucial before the dashboard is designed because the desired analytics and insights might not be evident from the raw data. In addition, raw data often contains irrelevant data clusters, incorrect values, and duplicates that might hamper analytics.

Data harmonization is particularly essential when data is gathered from various sources. It ensures that all data elements properly align and can be used accurately in subsequent analysis. Proper harmonization is also vital to get meaningful, consistent results. When building overdose surveillance datasets, there is rarely compatibility between the data sources since different organizations collect data in different formats. All these factors make it crucial to apply data harmonization before designing a dashboard for drug overdose surveillance.

DATA HARMONIZATION CAN BE BROKEN DOWN INTO THE FOLLOWING STEPS:




DATA AGGREGATION

Data from disparate sources is searched and collected in this step. The data can be further generalized on the basis of key variables to obtain a higher level view of the data.



DATA CLEANING

Raw data collected from different sources might be prone to several imperfections such as missing, inconsistent, or irrelevant data. Data cleaning removes out-of-date, imprecise, or incomplete data to make the final insights more accurate and clear. Here, missing values might be removed or imputed,



format inconsistencies addressed, and column names might be made cohesive across sources. Data transformations will be applied as necessary and outliers will be identified and removed.

DATA INTEGRATION

First key variables across different datasets are identified for harmonization. This step can be tricky because some variables might not be uniform across sources or might not be present across all sources. Pure data integration calls for information that corresponds exactly across data sources while practical integration involves finding information that is similar but not exact. Data is then pooled by using these key variables to guide integration and converted to a common format.

DATA FILTERING

This is a harmonization step that refines datasets by pruning away irrelevant or unnecessary attributes. The integrated data can now be filtered in different ways to suit different stakeholders' needs.

QUALITY CHECKING

Finally, a quality check can be run on the data to ensure an acceptable level of integrity and validity. There are a number of metrics that can be used to check data quality but commonly used metrics include: 1) compliance with technical requirements (integrity), 2) presence of desired data values and attributes presence of data values (completeness), 3) uncertain data values (consistency), 4) unexpected associations and relations (accuracy)

DATA PREPARATION

DATA GOVERNANCE

Data governance is the management of data to ensure accuracy as per the requirements and standards of specific organizations. Dashboard development teams will need to consider the data governance standards and regulations in place for each of the data sources desired to be used in the final overdose surveillance dashboard.

BENEFITS OF DATA GOVERNANCE

- **BETTER DECISION-MAKING:** Well governed data enables better decision making. Well governed data is more discoverable thereby reaching relevant parties more easily and enabling discovery of insights. Stakeholders can also be sure that decisions and actions are made from the right data increasing accuracy and trust in the data.
- **IMPROVED DATA UNDERSTANDING AND LINEAGE:** Well-implemented data governance processes lend to a better understanding of data storage and documentation. User permissions are assigned carefully to avoid inappropriate access to data but also to understand who is responsible for specific data. Data governance therefore leads to greater accountability and management of data.
- **SUSTAINING COMPLIANCE:** Maintaining compliance to key privacy and legal data regulations is important in many data sectors and particularly in public health. Data governance creates well managed data whose privacy and access mechanisms are reviewed periodically to ensure compliance. Data governance allows companies to assign suitable security measures and employ suitable desensitization techniques where needed.
- **ENHANCING DATA EFFICIENCY:** Simple queries can be time consuming if the data is scattered across an organization and isn't managed to conform to common formats. Data pre-processing often takes a substantial amount of time for analytics teams – this is time that can be better allocated if the data were consistently well managed. Effective data governance can ensure that data is always analytics –ready so that insights can be extracted quickly. When data is centralized and processed, it

becomes accessible enough to reveal one of the leading benefits of data governance: better decision-making.

CHALLENGES OF DATA GOVERNANCE

While there are many benefits of data governance, not all organizations that collect data use effective governance practices for their data. This is because data governance has several challenges:

LIMITED RESOURCES: Many projects do not plan or budget for data governance efforts at the beginning of the project. In this case, data governance might fall on analytics or IT employees who have other priorities.

SILOED DATA: When data is collected at a rapid pace from new data sources across different units of an organization, data can become siloed in existing teams and units making it harder to harmonize and govern.

LACK OF LEADERSHIP: Data governance needs to become a priority for people in leadership positions to ensure it is prioritized and accomplished. Someone with data literacy skills needs to develop internal policies for data governance.

POOR DATA QUALITY AND CONTEXT: Projects often spend time collecting data of poor quality and are not ultimately useful for the project's objectives. Data governance for these kinds of data is extremely time consuming because a lot of time is spent in fixing and filtering the data for effective use.

BEST PRACTICES FOR DATA GOVERNANCE

- ✓ Start small and build to the big picture: Data governance involves people, processes, and technology. Start the data governance plan with people. Building the right team with appropriate expertise is crucial. The team can then create governance processes which would inform the technology needed for execution. These three components will result in an effective governance plan.
- ✓ Define data governance team roles: A governance plan can be successful when roles and responsibilities are clearly defined. Improving data quality and collaboration between teams are two goals of a governance plan. Achieving these goals involves including key players from across the organization/project. A data governance board should be designated to oversee the entire strategy. This board can help guide the governance plan,

specific data sets. It is their responsibility to oversee data collection and propose new strategies, and develop new policies. Tactical team members follow guidance set forth by the governance board and create data processes to be implemented. Data owners are team members that are responsible for maintain quality standards.

- ✔ Use metrics to measure progress: Once a data governance plan has been developed and deployed, it is important to measure progress using appropriate metrics. These metrics need to be defined before introducing data policies. These metrics can help serve as checkpoints to ensure that the policies are serving a practical purpose and reveal areas for improvement.
- ✔ Encourage frequent communication: The data governance team should communicate frequently with other team leaders and data owners to give updates, seek feedback, and create new strategies. Consistent communication can keep all stakeholders involved in different facets of data governance and create an impactful strategy that yields benefits.

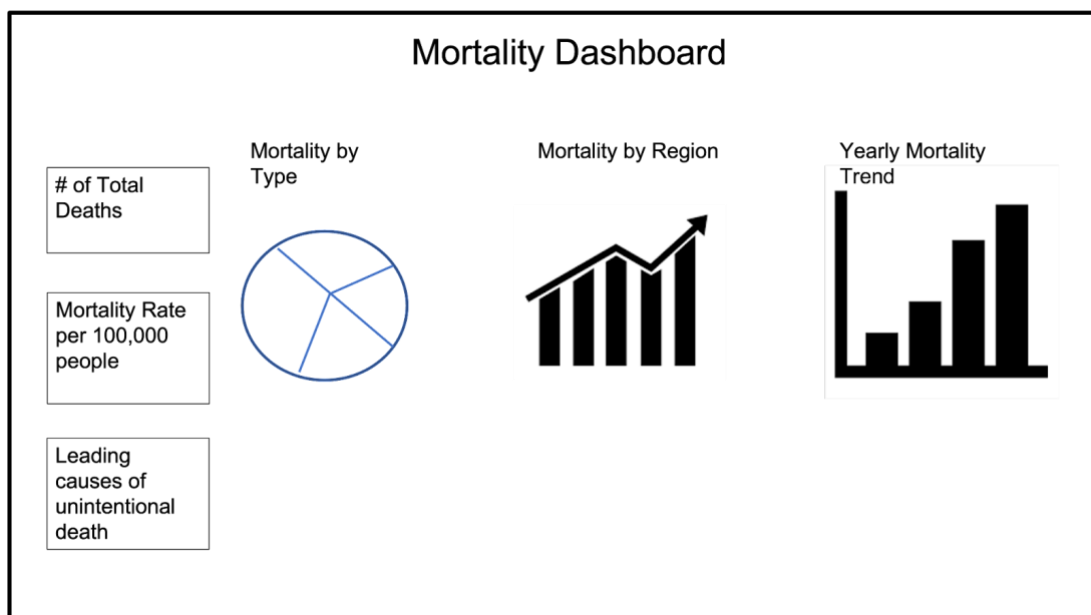
PLANNING & CREATING DASHBOARDS

WIREFRAME BUILDING FOR DASHBOARDS

WHY WIREFRAMING?

Wireframing is the first step to building a dashboard. Wireframing is often the most challenging yet overlooked phase of a dashboard building project. A wireframe is a visual layout of your dashboard. The wireframe captures what graphs and visual displays will be part of the dashboard and how they will be arranged. These wireframes are not fully functional but a representation of the functionality that the dashboard will eventually contain. Creating a clear wireframe allows for iterative refinement of ideas and lends clarity to how the dashboard should be built. Here is a wireframe that describes a mortality dashboard.

HERE ARE COUPLE OF WIREFRAMES THAT DESCRIBE SALES PERFORMANCE DASHBOARDS



BUILDING A WIREFRAME BEFORE A DASHBOARD RESULTS IN THE FOLLOWING BENEFITS:

- **PRIORITIZE MOST IMPORTANT DATA:** Wireframing helps clearly understand the goals of the dashboard and prioritize the most important to display.
- **MAKE SURE YOUR STAKEHOLDERS ARE HAPPY WITH THE END RESULT:** Wireframes help convey the visual feel and structure of the dashboard before spending enormous time and resources on developing the dashboard. Stakeholders have the opportunity to provide feedback and make sure that the dashboard will answer critical questions and offer insights before moving to the development phase.
- **MEANS OF COMMUNICATION:** A wireframe helps avoid miscommunication and expensive changes to dashboards after development. Wireframes offer a visual language for designers to convey their ideas and vision for the dashboard for effective communication and visualization. Visual language has the benefit of conveying depth of space, direction, and contrast, which help the viewers make connection and relationship between elements more intuitively. More intricate wireframes can also simulate interactions between elements thereby creating more intuitive representations of the dashboard. Armed with a thorough understanding of the dashboard, all members of the management and development team will be able to raise concerns and collaboratively improve the dashboard.
- **TRANSFER CHARTS ONTO THE FINAL DASHBOARD:** Having a wireframe that has gone through the iterative process of refinement and approval by all team members makes it relatively straightforward for developers to build the dashboard. The chances of miscommunication and ambiguity in building the desired dashboard are low since the wireframe conveys the dashboard elements and placement clearly.

HOW TO CREATE WIREFRAMES

There are several tools that can be used to create wireframes. [Balsamiq](#), [Powerpoint](#), [Google slides](#), [Adobe XD](#), and [Figma](#) are some options for building wireframes. While these tools are great for creating wireframes, a simple solution such as drawing basic designs on paper works equally well. This low-tech solution to wireframes removes the technology barrier and might make iterating on the design more efficient. There are a few things to consider before starting to create a wireframe. Identify what data to display, what elements will be used, and how users will interact with the dashboard.

THINK ABOUT NAVIGATION

Depending on the project, the dashboard might be fairly simple or complicated with several interactions and visuals. Consider how users will navigate to the most important information and how they might want to interact with the dashboard to gather custom insights.

SET GRIDS AND USE BOXES

An important thing to convey with the wireframe is the relative proportions of items on the dashboard. Use grids to demonstrate these dimensions. Using grids provide a guide to help you determine the proper spacing between items and it will give you an idea of how things will look on the page. Use boxes to represent page elements such as visuals, text, or ads.

INCLUDE IMPORTANT ELEMENTS

Make a list of the main components that need to be on the page. For example, if you're creating a wireframe for a dashboard that displays number of covid cases per month/week/custom period, you will expect users to select the desired time period. Consider how the user can choose the time period using a drop down or a calendar view. Consider site navigation and where you're going to place user login areas, content, search boxes, and the company logo.

SHARE THE WIREFRAME WITH OTHERS

When you complete the wireframe, it's time to get feedback from other people. Consider using an online tool that lets you share the wireframe with others and offers editing/commenting capabilities. An online app that's designed to let multiple people view the wireframe and participate in online chat simultaneously can help keep track of revisions and be a real time saver.



THERE ARE THREE KEY PRINCIPLES TO ENSURE THAT YOUR WIREFRAME IS GOOD AND USEFUL FOR ALL STAKEHOLDERS.

- 1. CLARITY:** Your wireframe needs to answer the questions of what the dashboard will provide for users. The wireframe should be an aid for the developers to visualize the dashboard layout and ensure that the user's most important questions are answered and goals are achievable without being distracted by more aesthetic considerations.
- 2. ORGANIZATION AND USABILITY:** Ease of navigation and access to important insights in the dashboard can increase user confidence in the message being conveyed. Aesthetic elements like buttons or boxes in unexpected places cause confusion and overall dissatisfaction. Details like this can be organized and

addressed at the wireframing stage by using familiar navigational processes and intuitive positioning for insights.

- 3. SIMPLICITY:** Too much information, text, and colors can be distracting and take away from the main message conveyed by the dashboard. Avoid being bogged down by considerations of colors and other aesthetic elements at the wireframing stage. Attractiveness at this stage is not a consideration.

STEPS TO CREATE A WIREFRAME:



BRAINSTORM THE CONTENT OF THE DASHBOARD AND ITS INTENDED PURPOSE USING THE FOLLOWING QUESTIONS

- What are the intended user goals when interacting with this dashboard?
- Exactly how can the content be organized to support these goals?
- Where should your main message and logo go?
- What should the user see first when arriving at the dashboard?
- Where is the call to action?
- What will the user expect to see on certain areas of the page?



ADD ELEMENTS FOR THE DASHBOARD WIREFRAME

Start adding the elements starting with the most important visuals and move on to smaller areas such as call to actions, interactive elements, survey structures, and so on. You can also add buttons to generate reports, send notifications, do bulk actions, etc. place the most important aspect of your dashboard at the top-left corner. This is what you want to keep in mind when beginning to outline your dashboard. Visual language is only helpful when it is consistent, clean and simple. Use very few colors (or preferably, no colors at all except for different shades of gray) just to draw the necessary focus and contrast to the content. Use simple shapes and simplified visualization to demonstrate the relationship between elements.



ADD INTERACTIONS FOR DASHBOARD WIREFRAME

Once you have your basic wireframe for the dashboard and related pages and screens ready, you can start adding links to interconnect various screens and page states. Once the linking has been done, you can set a transition, animation, gesture, or effect for the link. When the client clicks the component, it will jump to life, showing them how the real dashboard page will behave.



ADD STICKY NOTES FOR DASHBOARD WIREFRAME

The next step is to annotate or make notes in your dashboard wireframe to show the stakeholders what goes where. You can use the sticky note widgets for this and add text to it to explain what a particular button does or what a particular portion of the dashboard shows.

SHARE YOUR DASHBOARD

Your dashboard wireframe is now ready to be shared with collaborators and other stakeholders. The iterative process of receiving feedback, incorporating changes, begins at this stage until all parties are happy with the wireframe design. After the iterations are done, you can proceed to add design elements and other aesthetic features and finally test your prototypes with users.

PLANNING & CREATING DASHBOARDS

BEST PRACTICES FOR BUILDING DASHBOARDS

- ✔ **SELECT THE RIGHT TYPE OF DASHBOARD:** Be aware of the type of dashboard that you want to build based on its analytical purpose. Dashboards should be designed while keeping target audiences and the analytical purpose in mind. As reference, here are a few types of dashboards:
 - STRATEGIC – These dashboards focus on displaying long-term strategies of an organization and high-level metrics based on aggregated data.
 - OPERATIONAL – Dashboards for use in day-to-day operations of an organization showing analytics over shorter time frames. More specific insights on granular data can be obtained.
 - ANALYTICAL – Most used by data analysts, these dashboards are backed by large amounts of data and can be powered by predictive models for user-defined insights.
 - TACTICAL – Suitable for non-technical audiences such as managers for tracking performance.

- ✔ **CONSIDER YOUR AUDIENCE:** Tailor your dashboard design, analytics, and the level of detail to your intended audience. Creating the most effective dashboard will involve identifying your audience and determining what they want to get from the dashboard. What level of technical expertise do they have and what level of detail are they looking to gather from the dashboard? Choose the metrics and graphics accordingly. Finally, the context and devices on which users will access the dashboards will have an impact on the design choices.

- ✔ **TELL A CLEAR STORY AND MAKE IT SIMPLE:** We often have lots of data and analytics to convey to the user. Create a clear story using the data and convey it using simple methods. The visual layout of the dashboard is crucial

to telling a complex story using simple and easy to understand visuals. Employ an inverted pyramid design - display the most important insights on the top part of the dashboard, trends in the middle, and granular details in the bottom. This design ensures that users get the most important information at the first glance and can drill down if interested.

✔ **CHOOSE THE LAYOUT CAREFULLY:** Visual organization of the dashboard can help users find information faster and more easily. The longer a user has to spend on the dashboard to get the information, the less effective the dashboard. As a rule of thumb – display the most important information first at the top of the screen on the upper left hand corner. This should usually be high level insights. More detailed charts can follow below this section. This placement also helps each viewer to have access to the data they need. Users needing just the highlights can obtain them at a glance and users looking for further details can engage further.

✔ **USE INTERACTIVE ELEMENTS:** Once the simple high level analytics are conveyed, some users will want to dig deeper into trends and metrics. Use interactive elements such as drill-downs, click-to-filter, and other widgets that let the user interact with the dashboard and view different perspectives of the data to improve user experience. These interactive features allow users to focus on a particular element, variable or metric without having to crowd the dashboard with too much information.

✔ **PRIORITIZE SIMPLICITY AND MINIMIZE COLORS:** When creating charts and other graphics, resist the urge to use all design options such as backgrounds, frames, gridlines, colors, etc. Every additional design element present in a chart has to have a purpose and should convey specific information that would be lost otherwise. Pay attention to your labels and legend making sure that the font size is large enough to be readable and the colors are minimal.

✔ **CHOOSE THE RIGHT VISUALIZATIONS:** The data visualizations used for the dashboard need to represent the data and information correctly. Consider what you are trying to display while choosing visualizations:

- Relationship: how are the variables connected?
- Comparison: are you trying to compare variables side by side?
- Composition: are you breaking data into separate components?
- Distribution: are you showing the range and grouping of values within data?

✔ Bar charts are useful for comparing items in the same category. These are simple and easy to understand visuals. Line charts are great to display trends of change across a continuum. These charts are widely used so they're familiar to most people and easily understandable. Sparklines can be a good choice when there are lot of metrics and only the trends need to be shown. These can be good choices for the middle of the dashboard. Scatterplots are an advanced type of visualization so reserve them for tech-savvy users and if you need to show correlations between variables. Gauge charts can be effective for providing context. They use various colors to represent ranges of values for the same metric making it easy to spot differences. Pie charts are best avoided if there are multiple categories since it can be difficult to discern small differences between categories. Similarly, bubble charts are a poor choice for dashboards since they require too much mental effort on the part of the user to decipher the information being displayed.

✔ Optimize for multiple devices: Optimization for mobile or tablet is another critical point in the dashboard development process. Offering remote access to important insights and data can enable decision making on the go without the need for specific equipment.

PLANNING & CREATING DASHBOARDS

DASHBOARD EVALUATION

Once a dashboard has been created and deployed, it is essential to evaluate the dashboard on several aspects to identify if there are needs that aren't being met by the dashboard. Dashboard evaluation also helps developers identify if users and stakeholders are engaging with the dashboard in the intended way.



DASHBOARD EVALUATION HELPS ANSWER THE FOLLOWING KEY QUESTIONS:

- Is the dashboard meeting the needs of the intended audience?
- Are there facets of the dashboard that can be improved to better convey actionable insights from the data?

Dashboards can be evaluated on a number of aspects such as effectiveness of the visuals and analytics, and availability of customization features. A recent review article (<https://arxiv.org/pdf/2009.04792.pdf>) groups evaluation aspects into three themes:

1

INTERACTION EFFECTIVENESS: This theme focuses on the users' interaction with the dashboard with the goal of evaluating how effective the dashboard is. It can measure how users interact with it, how long the interaction lasts, and how the interactions develop through different tasks. This theme can be used to evaluate visualization used in dashboards since the visualizations primarily invoke interactions between users and dashboards.

2

USER EXPERIENCE: Evaluations in this theme focus on seeking subjective feedback from users in terms of usability issues, extra functionality to include and the intent to engage with the system in the future. These evaluations typically are administered as surveys with responses on a Likert scale as well as open ended responses.

3

SYSTEM EFFICACY: The main goal here is to understand if the dashboard has accurate analytics and outcomes. We can also evaluate the quality of implementations of the dashboard as well as if the functions presented are sufficient for realizing the goals of the dashboard.

There are a few steps to creating mechanisms for evaluating dashboards. Some of these steps are in alignment with the [CDC's Framework for Program Evaluation](#). Specifically, Step 3: Focus the Evaluation determines Utility, Propriety, Accuracy, and Feasibility of a program much like the evaluation plan for dashboards described here. The CDC's evaluation framework also aims to identify areas where improvements are needed so that developers can make appropriate improvements according to the feedback provided by their stakeholders.



CREATE AN EVALUATION GAME PLAN.

This section should contain specifics of the product being evaluated, the audience that will evaluate the product, and the evaluation budget. Consider the following questions:

- Why are you evaluating this product?
- Will all components of the product be evaluated? If not, which sections will be prioritized?
- Who is the audience served by the dashboard?
- How much time/money is being allocated for this evaluation?
- Is there a deadline for finishing the evaluation?



IDENTIFY THE USERS THAT WILL PARTICIPATE IN THIS EVALUATION.

Create plans on reaching them with the evaluation. Some evaluations can be administered in the dashboard using a call to action button. Other evaluations can be mass emailed to your users.



DEVELOP QUESTIONS THAT WILL ENABLE YOU TO EVALUATE THE DASHBOARD

Consider what questions a user will be able to answer based on their interactions with the dashboard. If there are key takeaways you want your users to learn from the dashboard, think of questions that will assess if those key messages are being conveyed.



ORGANIZE A GROUP OF USERS FOR THE EVALUATION

Think whether the testing group will consist of actual users, third party testers, or colleagues who are playing the role of testers. How many people do you need for your evaluation? What is the timeline of this evaluation?

ADMINISTERING THE EVALUATION

How will users be introduced to the evaluation set up? Will they interact with the dashboard as usual and then answer questions about their experience? Will you set up special scenarios and/or tasks they should be able to accomplish? Do you need any specific technology (e.g. survey software) to administer the evaluation? Will users be compensated or receive any incentive for participating in the evaluation?

A SAMPLE SURVEY FOR EVALUATING DASHBOARDS CAN LOOK LIKE BELOW:



- How often do you access this dashboard (Theme: Interaction Effectiveness)?
 - Daily
 - Weekly
 - Monthly
 - Quarterly
 - Never
 - Other (please specify)
- Why do you typically view dashboards (Theme: Interaction Effectiveness)?
- How useful do you find the data available (Theme: System Efficacy)?
 - Not at all useful
 - Somewhat useful
 - Very useful
- What information is most helpful? (Theme: System Efficacy) (feel free to list more than one)
- What information is the least helpful? (Theme: System Efficacy) (feel free to list more than one)

- How easy do you find the current dashboards to navigate (Theme: User Experience)?
 - Difficult
 - Somewhat Difficult
 - Somewhat easy
 - Easy
 - Very Easy
- What would make them easier to navigate (Theme: User Experience)?
- What additional data would you like to see represented in these dashboards (Theme: System Efficacy)?
- How satisfied are you with the dashboard (Theme: System Efficacy)?
 - Extremely Satisfied
 - Moderately Satisfied
 - Neutral
 - Moderately Dissatisfied
 - Extremely Dissatisfied
- What do you like most about the dashboard (Theme: System Efficacy)?
- What do you like least about the dashboard (Theme: System Efficacy)?
- Do you have any other questions, comments, or suggestions about the new dashboard (Theme: System Efficacy)?

PLANNING & CREATING DASHBOARDS

DASHBOARD MAINTENANCE & ANALYTICS

All dashboards need a maintenance plan to keep the dashboard updated with the most current data. The data sources underlying a dashboard can change over time making insights drawn from older versions obsolete. Dashboards need to change along with changing data to provide relevant analytics. The best way to accomplish this is to set up scheduled times to review dashboards after deployment.

The schedule can be created depending on how rapidly data changes happen in the specific domain. Providing a way for users to alert dashboard creators regarding any issues will also enable effective dashboard maintenance. The principle of dashboard maintenance involves continuously improving and updating a dashboard through an iterative process. Iterations should be informed by data updates or by feedback of users.

HERE A FEW POINTERS TO GUIDE THE ITERATIVE IMPROVEMENT PROCESS:



GET FEEDBACK AFTER LAUNCH: Some of the best feedback you can gather on your dashboard will be from your audience after launching the dashboard. Create an avenue for users to leave feedback, offer suggestions, or ask questions. This can be done via a call to action. Alternatively, provide your email address or a Google form. Make it extremely easy and simple for users to leave feedback. The greater the time and effort required to leave feedback, the less feedback you will get. Simplify the process of collecting and acting on the feedback. The more complicated the process, the less likely it is that you will iterate on the feedback. This will ensure the audience's voice is heard and is used to make the dashboard better and better. See Section 7 for sample surveys that can be used to gather feedback. Create a structured way to collect, process, and act on that feedback.



AUDIENCE TO COMMUNITY: Consider creating a platform where your audience can form a community. Most dashboards use a one-way feedback channel where the audience cannot establish a back-and-forth communication with the dashboard creators. Using a community building tool like Slack can help get insights into how users perceive the dashboard and gather direct feedback. When multiple users discuss or report the same issue, it is apparent that the feedback is important to address.



ITERATION SCHEDULE: Set up an iteration schedule where you review the feedback collected from all channels in that period. A regular interval works best depending on how much feedback you typically receive. Gather feedback, create processes for integrating and/or adding to the dashboard.



The following dashboard items need to be reviewed periodically. Establish a schedule for these reviews.

- **ADOPTION AND USEFULNESS METRICS OF THE DASHBOARD:** These metrics can help you gauge if user adoption and engagement are at the desired levels. A consistent drop in these metrics can indicate that the dashboard is no longer providing useful insights and that it might need to be updated.
 - Total dashboard views
 - Repeat dashboard views
 - Unique dashboard viewers
- **ACCURACY CHECK**
 - Do queries produce expected results?: Review if the analytics and visuals of the dashboard are operating as expected and producing the right results and insights. Data downloads might be used as a metric to check for accuracy. Note that certain stakeholders such as legislators might need to download visualizations and graphics for portability and demonstration.
 - Have the underlying data sources or data models for this dashboard changed?: Check if it is time for a data update? If the current data has been in use for a long time, more recent data might be available rendering the dashboard out-of-date.
- **DATA MAINTENANCE:** Check the load being placed on the dashboard. -- Is the dashboard able to keep up with incoming requests and user traffic? If the dashboard is experiencing an inordinate amount of traffic, it might be time to update the computational resources to maintain a fast turnaround time.
- **OPTIMIZE SQL QUERIES IF NECESSARY:** When operating on large sets of data, sub-optimal SQL queries will lead to long processing times

leading to user frustration. Continually optimize SQL queries that might be taking too long.

- Open and run the dashboard to see if any errors pop up: Pretend to be a user and run all the analytics and queries on the dashboard to see if any errors need to be addressed. Interacting with the dashboard from a user's perspective can highlight other issues as well.
- Check for data quality along the following aspects:
 - Accuracy: for whatever data described, it needs to be accurate.
 - Relevancy: the data should meet the requirements for the intended use.
 - Completeness: the data should not have missing values or miss data records.
 - Timeliness: the data should be up to date.

PLANNING & CREATING DASHBOARDS

TOOLS TO CREATE DASHBOARDS



Dashboards can be created using programmatic tools as well as Graphical User Interface (GUI) based options.

Below are a few of these tools that are popularly used for building dashboards.



[Dash](#): Dash is an open source framework for building data visualization interfaces using Python. Dash helps data scientists and stakeholders build dashboards without requiring advanced web development knowledge.



[Google Data Studio](#): Google Data Studio is a fully free option for analyzing and displaying data via dashboards. It can connect to a wide range of data sources to create informative and visual dashboards that are easy to interpret, share, and customize.



[Sisense](#): Sisense is another business intelligence solution that has been used in the healthcare arena to manage data with analytics, visuals and reporting. Data can be combined from many disparate sources and populated into a single database. Sisense provides a variety of dashboards to project the data through maps, Key Performance Indicators, charts, trends, scatter plots and more.



[ArcGIS](#): ArcGIS Dashboards specialize in location-based analytics by using maps embedded with data and visualizations to convey geographic information. These dashboards allow users to place events, explore impacts of data, and see trends in the context of location and geography.



[Microsoft Power BI](#): Power BI is a suite of business intelligence tools such as software services, apps and data connectors. It offers a wide range of detailed and attractive visualizations that range from simple to complex. Microsoft Power BI is a web and cloud-based analytics and data visualization platform. It is available as a desktop or mobile application, with interactive reports, real-time dashboards and datasets that can connect to dozens of data sources. Power BI also features embedded visuals, trend identification, custom reports and SQL Server Analysis Services.



[Tableau Public](#): Tableau Public is part of the Tableau software portfolio that offers three different software choices: Tableau Public, Tableau Reader and Tableau Desktop. Tableau Public is the free package that offers data visualization, analysis and business intelligence for companies of all sizes. Tableau Public provides access to most of Tableau’s paid range of features – in-depth insights, data storytelling and analytics on demand.



[Gooddata](#): Gooddata provides cloud-based business intelligence and analytics and has over 80,000 business customers of all sizes globally. Gooddata dashboards can be embedded into existing applications for real-time analytics. It has user-friendly interfaces and dashboards, and is used widely for tracking consumer behavior, marketing and sales metrics.



[Domo](#): Built on the Domo platform, Domo’s dashboards provide data in real-time, so your data is never stale. Create and share custom views of your data on the fly, in minutes, with dashboards that are orders of magnitude easier to use. The goal of the Domo dashboard is, in essence, to create a visual narrative from your data. It offers all manner of colors and charts and graphs – a complete visual portrait of your data. To make it user friendly across all of staff no software code is required to build these complete data-driven narratives.

PUBLIC HEALTH

PUBLIC HEALTH DASHBOARDS

Public health dashboards have been used increasingly to raise awareness among public stakeholders and track progress on key health issues such as COVID prevalence, COVID vaccinations, polio vaccinations, and maternal and infant health. These are only a few examples of the disparate public health arenas in which dashboards have been used

We highlight a few public health areas and the dashboards that drive better policy and decision making through the effective use of data.

EXAMPLES OF EXISTING PUBLIC HEALTH DASHBOARDS

Dashboards have been used in practice across several areas of public health such as disseminating COVID-19 statistics, tracking global immunizations, studying maternal health, etc. The increasing focus on drug overdoses has driven the creation of more dashboards in this arena. Currently, several states in the U.S. use dashboards to explore maternal health, overdose deaths, and other key health outcomes.

A FEW EXAMPLES OF EXISTING PUBLIC HEALTH DRUG OVERDOSE DASHBOARDS ARE LISTED BELOW:



[Minnesota Drug Overdose Dashboard](#)

[North Carolina Opioid Dashboard](#)

[California Overdose Surveillance Dashboard](#)

[Wisconsin Opioid Dashboard](#)

COMMONLY USED STANDARDS, METRICS, AND ASSESSMENT INDICATORS

The metrics and standards used in public health dashboards can vary based on the intended purpose of the dashboards. Let's first review existing public health dashboards for different outcomes:



EXPLORING MATERNAL MORTALITY AND MORBIDITY:

Dashboards prove a useful tool in monitoring changes in maternal mortality. They are being used to analyze how budgets, demographic factors, and interventions could reduce rates of maternal mortality, especially in rural and low-income areas. These dashboards can help policy makers determine correlations among demographic factors such as age, income level, race and maternal mortality. These correlations can enable targeted interventions to reduce risk for specific demographics.



KEY METRICS AND INDICATORS BEING TRACKED INCLUDE:

- Infants born preterm
- Infants with low birth weight
- Late/No prenatal care
- Maternal smoking.
- Percentage of non-medically indicated early elective deliveries
- Maternal mortality rate per 100,000 live births
- Rate of severe maternal morbidity per 10,000 delivery hospitalizations
- Percentage of women ages 18-44 years who report ever talking with a health care provider about ways to prepare for a healthy pregnancy



CDC reports that polysubstance use, including tobacco, alcohol, and opioids, during pregnancy is common and can have negative effects both on the pregnant person and the baby (<https://www.cdc.gov/pregnancy/polysubstance-use-in-pregnancy.html>). Data suggests that polysubstance use is highest during early pregnancy. Pregnant women who were prescribed opioid pain medication were more likely to smoke tobacco according to a study in 2015. Limitations in availability of data currently limits targeted interventions for substance use among pregnant persons.

The [U.S. PREVENTIVE SERVICES TASK FORCE](#) (USPSTF) recommends the following tools to identify substance use for pregnant persons:

- ✓ [Unhealthy Drug Use: Screening](#)

- ✓ [Tobacco Smoking Cessation in Adults, Including Pregnant Women](#)

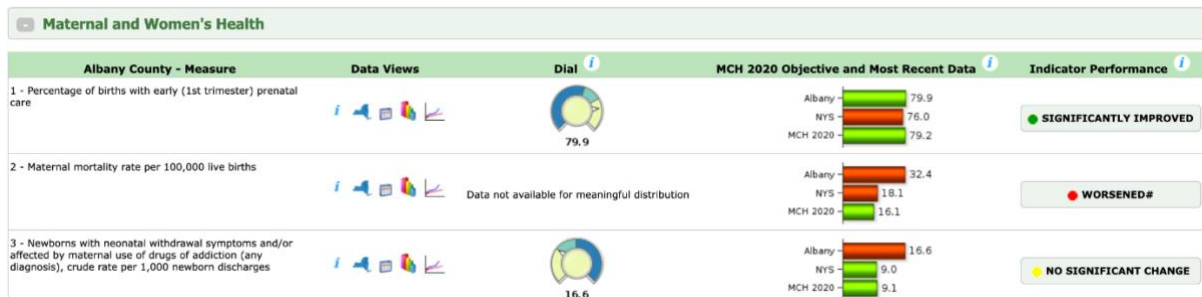
- ✓ [Unhealthy Alcohol Use: Screening and Behavioral Counseling Interventions](#)

EXAMPLE DASHBOARDS:



[New York State Maternal and Child Health Dashboard](#)

[Virginia Maternal and Child Health Dashboard](#)

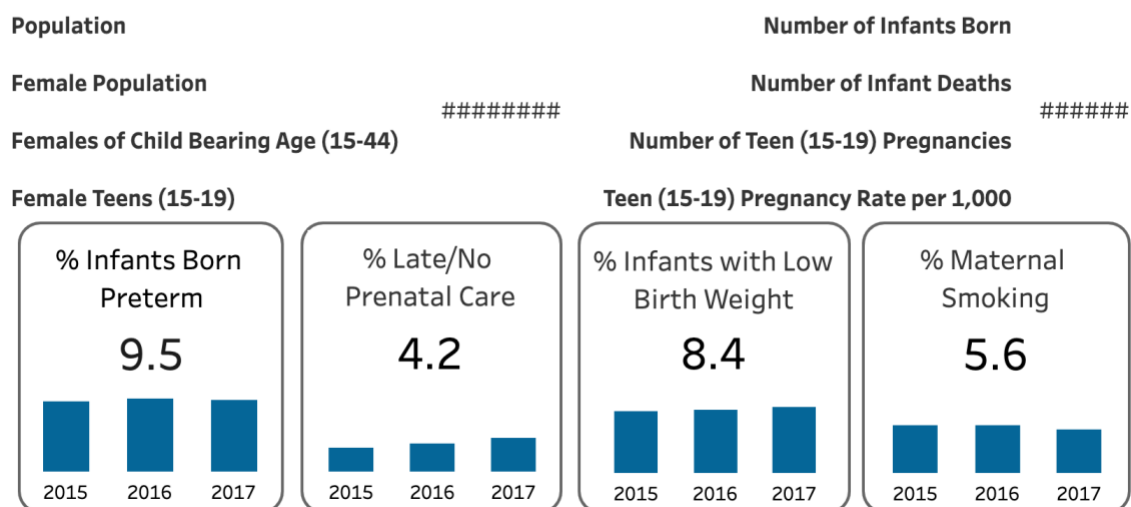


Source: [Maternal and Women's Health](#)

Maternal and Child Health - 2017

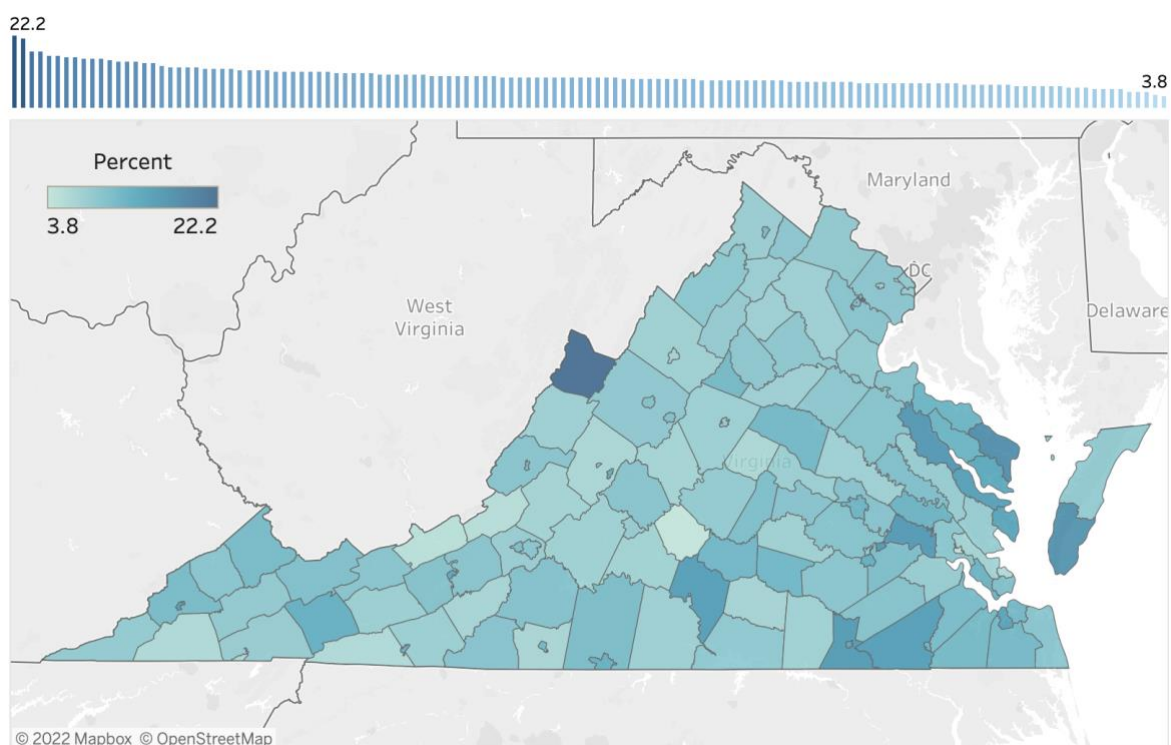
This page displays Maternal and Child Health related metrics for Virginia. Use Select Year, Select Health District, Select Locality controls to filter changes in the tables and map below. Use the Select Metric control to filter the map. Select All for state level data.

Select Year:
 Select Health District:
 Select Locality:

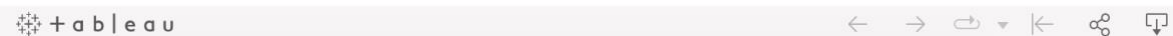


Source: [Maternal & Child Health](#)

Select Metric Graph below shows the Locality rate for the selected metric.



Data Source: VDH - Division of Vital Records Electronic Birth Certificate and OIM - Data Management



Source: [VDH - Division of Vital Records Electronic Birth Certificate and OIM - Data Management](#)

EXPLORING GLOBAL VACCINATION RATES:

The World Health Organization (WHO) provides dashboards for users to explore global trends and total numbers in reported cases of vaccine-preventable disease. These data are intended for countries to monitor improvements and identify gaps that can be targeted for interventions. National Immunization coverage at the global level is a key metric that is monitored yearly.



KEY METRICS BEING TRACKED INCLUDE:

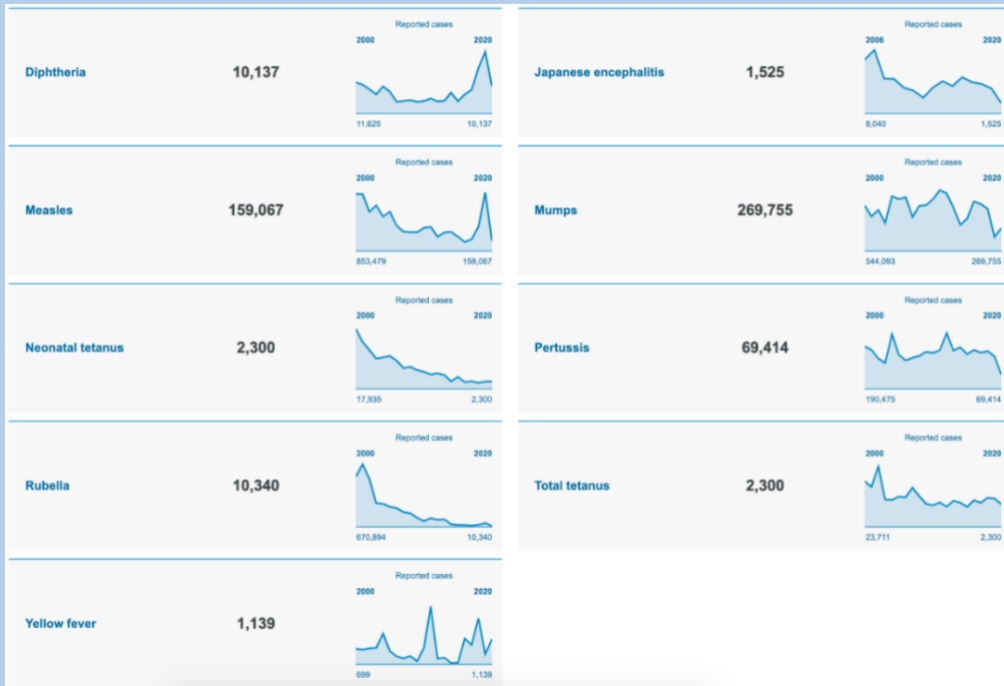
- Coverage of vaccination
- Number of reported cases

EXAMPLE DASHBOARDS:



[WHO Immunization Data Portal](#)

[WHO Polio Transition Monitoring Dashboard](#)



Source: [WHO Immunization Data Portal](#)



Source: [WHO Immunization Data Portal](#)

PUBLIC HEALTH

DRUG OVERDOSE DASHBOARDS

POLYSUBSTANCE OVERDOSES

Polysubstance use is defined as the use of two or more drugs including illegal and/or prescription drugs. This includes scenarios when the drugs are taken together or within short durations of time intentionally or unintentionally. Mixing drugs whether illegal or prescription is not safe since the effects of combining drugs may be stronger and unpredictable.



Drugs typically associated in polysubstance overdoses include but are not limited to:

- OPIOIDS (including synthetic opioids)
- CANNABINOIDS
- STIMULANTS
- BENZODIAZEPINES

Overdoses resulting from multiple substances are more difficult to treat. Naloxone, which is primarily effective for treating opioid overdoses may not effectively reverse a polysubstance overdose if substances such as benzodiazepines, stimulants, or alcohol are involved. Increased severity of side effects, acute health problems, complications due to co-occurring mental health issues, reduced metabolism are all factors in polysubstance use and overdoses. Polysubstance use is a growing issue with the CDC reports that opioid-involved overdoses often occur in combination with exposure to other opioids and/or other non-opioid substances (<https://www.cdc.gov/drugoverdose/deaths/other-drugs.html>) and heroin; IMF and cocaine; IMF and methamphetamine; and prescription or illicit opioids and benzodiazepines are examples of polysubstance exposures found in overdose deaths.



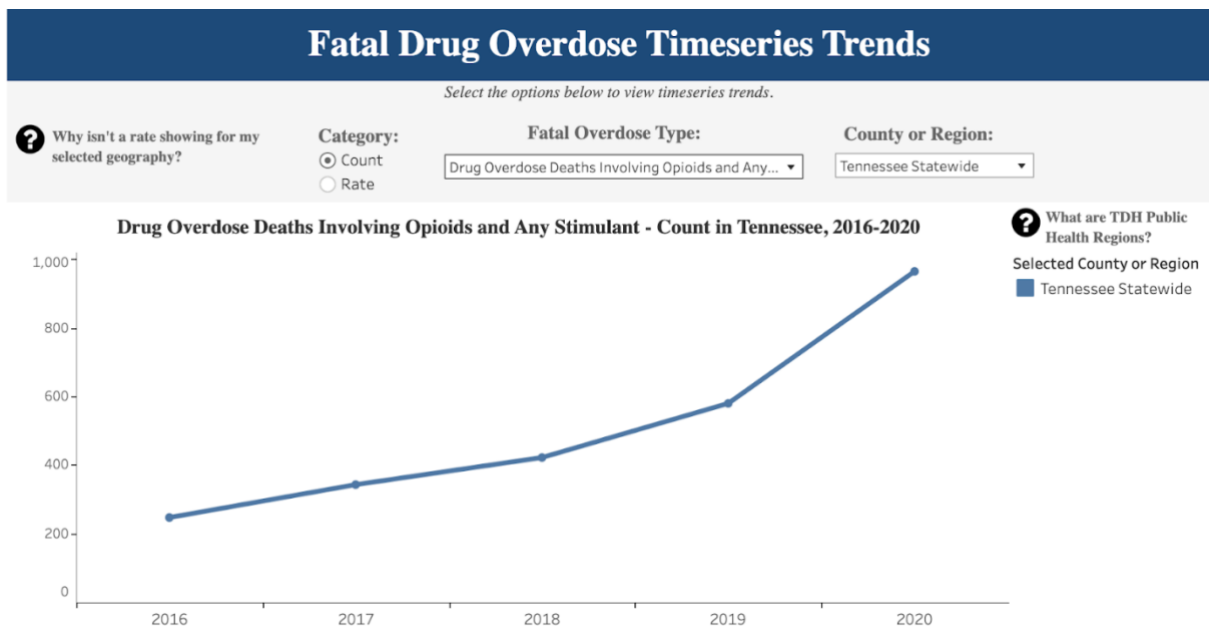
The same CDC webpage notes that there were significant increases in overdose deaths involving multiple substances from 2010 to 2016. In 2016, 70% of opioid overdose deaths involved another drug or alcohol such as heroin, cocaine, prescription opioids, benzodiazepines, alcohol, psychostimulants, and antidepressants. The National Institute for Health Care Management Foundation also notes that an increasing number of Americans are overdosing with more than one drug in their bodies.

DATASETS AND DASHBOARDS:

Data on polysubstance use and overdoses can be found at:



- [National Survey on Drug Use and Health Substance Use Exposure Dashboard](#)
- [Maryland Substance Use Dashboard](#)
- [Philadelphia Substance Use Dashboard](#)
- [Illinois Opioid Dashboard](#)
- [SUDORS Fatal Overdose Dashboard](#)
- [Tennessee Drug Overdose Dashboard](#)



Source: [Tennessee Drug Overdose Dashboard](#)

Fatal Drug Overdose Trends by County TN

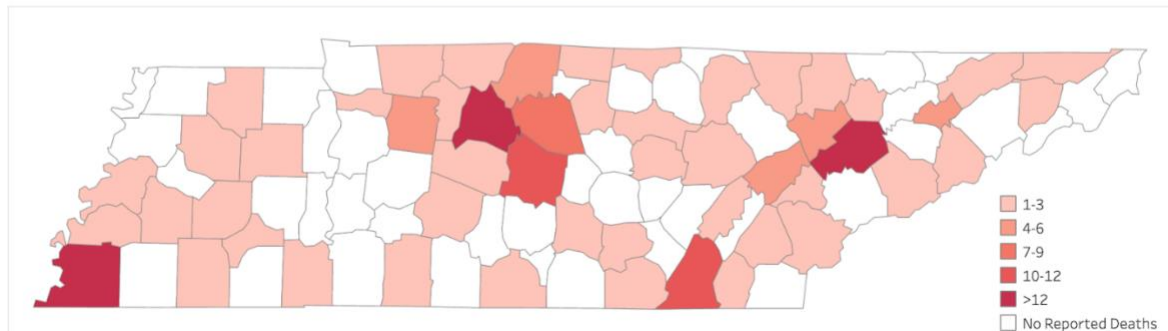
Why isn't a rate showing for my selected geography?

Select the options below to view trends by county.

Category: **Fatal Overdose Type:** Count Rate Drug Overdose Deaths Involving Opioids and Any S... Year: 2016

[About these Data](#)

Drug Overdose Deaths Involving Opioids and Any Stimulant - Count in Tennessee, 2016



Source: [Tennessee Drug Overdose Dashboard](#)

Distribution of overdose deaths by opioid and stimulant involvement, Overall (29 jurisdictions)

The largest percentage of deaths involved opioids without stimulants, while 4.3% of overdose deaths involved neither opioids nor stimulants.

| Overdose deaths involving: | Number of deaths | Percent of deaths |
|--------------------------------|------------------|-------------------|
| Opioids with stimulants | 13,287 | 34.9% |
| Opioids without stimulants | 18,307 | 48.1% |
| Stimulants without opioids | 4,807 | 12.6% |
| Neither opioids nor stimulants | 1,647 | 4.3% |

Source: [SUDORS Fatal Overdose Dashboard](#)

DRUG OVERDOSE

Several states have dashboards dedicated to displaying opioid related data. Typical data tabs in these dashboards include 1) Opioid Measures by County, 2) Opioid Measures by County Percent Change over Time, and 3) Opioid Measures over Time. Different states tend to track different metrics in their dashboards.



For example, North Carolina displays the following metrics in their [opioid and substance use dashboard](#).

- Deaths
- Foster Care
- ED Visits
- Housing 211 Calls
- Residents Dispensed Opioids
- Treatment Services
- Illicit Opioid opioid-involved overdose deaths
- Fentanyl test strip distribution
- Naloxone access



The following Key Performance Indicators (KPIs) are examples of metrics tracked in opioid dashboards.

- Cases of Overdose (OD) per 100,000 person-years Prevention
- Cases of OD per 100,000 person-years among enrollees <18 Prevention
- Cases of (Opioid Use Disorder) OUD per 1000 person-years Treatment
- Cases of OUD per 1000 person-years among enrollees <18 Treatment
- Evidence of Medication Assisted Treatment (MAT) following OD Treatment
- Initial opioid dose is <50 Morphine Milligram Equivalents (MME)/day Prevention
- No concurrent opioid and benzodiazepine use Prevention
- No opioid prescription fills following OD or OUD diagnosis Treatment

A comprehensive list of opioid overdose dashboards across the United States can be found at [Carolina Center for Health Informatics](#).

Example state-level drug overdose dashboards:



[Illinois Drug and Opioid Overdose Deaths](#)

[New Jersey Drug Dashboard](#)

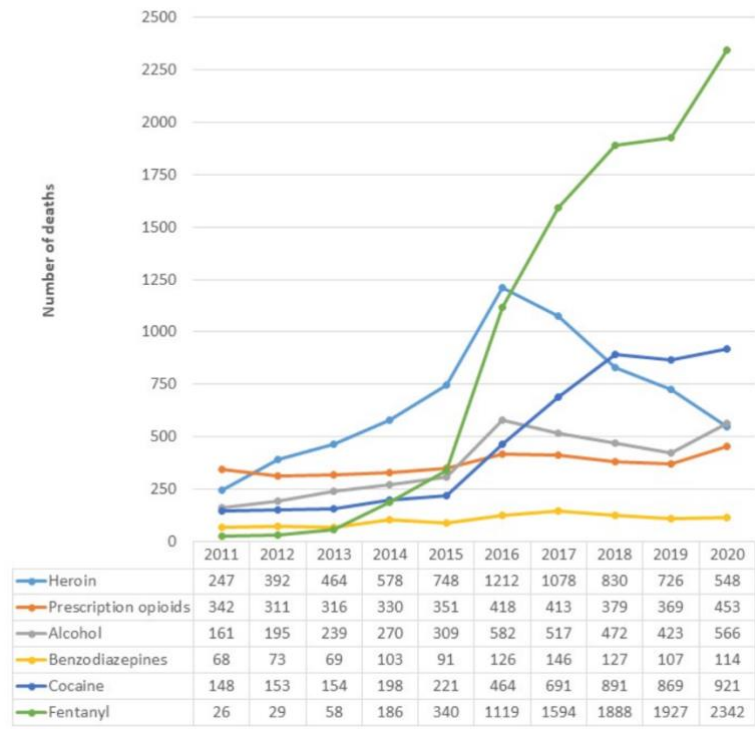
[New Jersey Overdose Data Dashboard](#)

[North Carolina Opioid and Substance Use Action Plan Data Dashboard](#)

[Virginia Opioid Dashboard](#)

[Minnesota Drug Overdose Dashboard](#)

Number of Unintentional Drug- and Alcohol-Related Intoxication Deaths by Selected Substances*, Maryland, 2011-2020.



Source: [Maryland Report on Drug and Alcohol-Related Deaths](#)

NALOXONE DASHBOARD

| | | | | | |
|--------------|--------------------------|-----------------------|-----------------------------------|------------------------------|-------------------------|
| Introduction | County & City | Incidents by Zip Code | Demographics (Age, Gender & Race) | Monthly Trends & Disposition | Incidents by Day & Hour |
|--------------|--------------------------|-----------------------|-----------------------------------|------------------------------|-------------------------|

Naloxone (Narcan®) Incidents (2017 - 2022)

| Total Incidents by County | | |
|---------------------------|---------|---------------|
| County | Percent | Count |
| Atlantic | 5.8% | 4,147 |
| Bergen | 4.3% | 3,071 |
| Burlington | 5.1% | 3,650 |
| Camden | 17.8% | 12,635 |
| Cape May | 1.6% | 1,130 |
| Cumberland | 3.7% | 2,631 |
| Essex | 13.2% | 9,354 |
| Gloucester | 4.1% | 2,924 |
| Hudson | 6.3% | 4,506 |
| Hunterdon | 0.5% | 346 |
| Mercer | 3.7% | 2,598 |
| Middlesex | 6.8% | 4,827 |
| Monmouth | 5.1% | 3,614 |
| Morris | 2.2% | 1,596 |
| Ocean | 4.8% | 3,442 |
| Passaic | 5.1% | 3,602 |
| Salem | 1.2% | 821 |
| Somerset | 1.5% | 1,059 |
| Sussex | 0.8% | 581 |
| Union | 5.4% | 3,864 |
| Warren | 0.9% | 641 |
| Grand Total | | 71,039 |

| Total Incidents by City | | |
|-------------------------|---------|-------|
| City | Percent | Count |
| Aberdeen | 0.03% | 17 |
| Allendale | * | * |
| Asbury Park | 0.13% | 82 |
| Atlantic Highlands | * | * |
| Bayonne | 0.11% | 71 |
| Bergenfield | 0.02% | 11 |
| Berkeley | 0.03% | 17 |
| Berlin | * | * |
| Bernards | * | * |
| Bloomsbury | * | * |
| Boonton | * | * |
| Bordentown | * | * |
| Branchburg | * | * |
| Brick | 0.1% | 64 |
| Bridgewater | 0.04% | 22 |
| Burlington | 0.01% | 6 |
| Chatham | * | * |
| Chester | * | * |
| Clementon | * | * |
| Clifton | 0.06% | 35 |
| Commercial | * | * |
| Delran | * | * |

| |
|--------------------------------|
| County |
| (All) <input type="text"/> |
| Start Date |
| 1/1/2017 <input type="text"/> |
| End Date |
| 5/31/2022 <input type="text"/> |

Source: [New Jersey Overdose Data Dashboard](#)

Dashboard

General CMS Statistics

Suspected Drug Death Statistics

Suicide Statistics

Homicide Statistics

CMS General Data

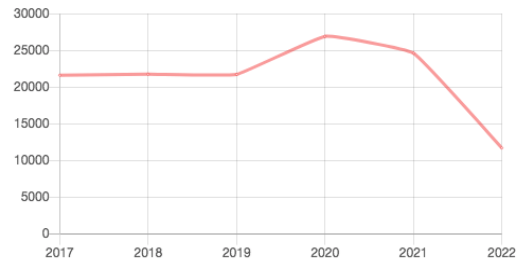
Statistics taken as of 06/20/2022, 03:01 AM

CMS Cases (YTD): 11722

Daily Case Rate (YTD): 68.55

Hourly Case Rate (YTD): 2.85

Annual Case Numbers



Source: [Centers of Medicare and Medicaid Services](#)

Drug Overdose in Tennessee

SOCIODEMOGRAPHICS

Clear

▶ AGE

▶ COALITION PRESENT

▶ ECONOMIC STATUS

▶ EDUCATIONAL ATTAINMENT

▶ GENERAL HEALTH

▶ RACE/ETHNICITY

▶ URBAN-RURAL CLASSIFICATION SCHEME

▶ VULNERABILITY INDEX

4,715,782

Opioid Painkiller Prescriptions, 2021

18,733

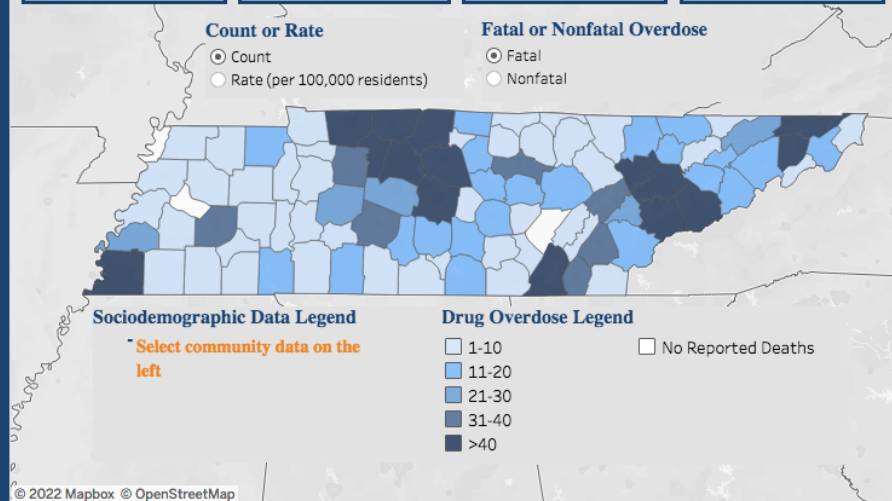
Nonfatal Overdose Outpatient Visits, 2020

7,063

Nonfatal Overdose Inpatient Stays, 2020

3,032

All Drug Overdose Deaths, 2020



Dive Deeper into the Data

Fatal Overdose



Nonfatal Overdose



Overdose Demographics



Opioids for Pain Prescription Trends



Benzodiazepine Prescription Trends



Source: [Tennessee Drug Overdose Dashboard](#)

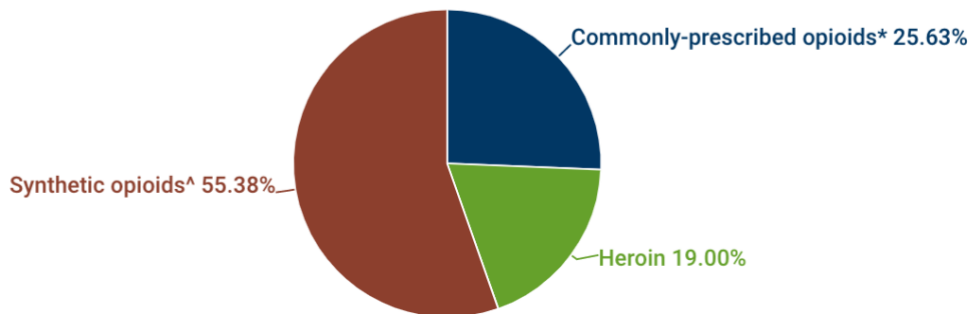
Opioid Overdose Deaths

Opioid-involved overdose deaths have increased in Minnesota since 2000.



Download data [Drug Overdose Data Sources](#)
 Source: Minnesota death certificates

In 2019, synthetic opioids were involved in the greatest proportion of opioid overdose deaths.



Source: [Minnesota Drug Overdose Dashboard](#)

In 2020, an average of 4 Virginians died of an opioid overdose daily.

This dashboard shows the number of emergency department visits and deaths due to an opioid overdose. Counts are from the most recent year reported and are compared to the previous year. A green indicator below the count means that the number is better than or the same as the previous year. A red indicator means that the number is worse than the previous year.

Emergency Department Visits

9,901 in 2020*
 33% ▲ increase from 2019

Overdose Deaths

1,478 in 2020*
 17% ▲ increase from 2019

* Counts should be considered provisional.

Data refreshed on: 12/1/2021.

+ a b | e a u

Source: [Virginia Department of Health](#)

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