

Reel Talk: Using R for Data Sharing

3:15 PM EST | December 7th, 2022 | 2022 SyS Symposium

Moderator:

- Caleb Weideman, MPH – Tennessee Department of Health

Presenters:

- Roseric Azondekon, PhD, MPH, MS – Centers for Disease Control
- Sandra Gonzalez, PhD, MPH – Division of Public Health, Nebraska DHHS; College of Education and Human Sciences, University of Nebraska-Lincoln
- Christopher Austin, MS – Division of Public Health, Nebraska DHHS; College of Education and Human Sciences, University of Nebraska-Lincoln
- Jason Geslois, MPH, MAS, EMBA – Kansas Department of Health and Environment
- Lauren Gracy, MPH – Kansas Department of Health and Environment



Council of State and Territorial Epidemiologists



Roseric Azondekon, PhD, MPH, MS
Centers for Disease Control



Rnssp V0.1.0

A Signature R Package for the
National Syndromic Surveillance Program

December 7, 2022



G. Roseric Azondekon, PhD, MPH, MS
Health Scientist





Agenda

Learning Objectives

Purpose

Secured Credentials Setup and Data Pull Interface

Vignettes and Templates

Documentation

Continuous Integration/Continuous Deploy (CI/CD)

Learning Objectives

At the end of this session, you will be able to:

1. Understand the Rnssp package design philosophy
2. Install the Rnssp package in your R environment
3. Understand the Rnssp data pull interface
4. Expand the Rnssp installation with NSSP R Markdown report templates
5. Navigate the Rnssp package and templates online documentations

What is Rnssp?

An R package to:

- Advance the practice of syndromic surveillance
- Improve reusability, reproducibility, and distribution of the analytical resources developed at NSSP
- Meet specific needs of NSSP's R users

Why an R package for NSSP?

Goals:

- Support technical capacity building for our Community of Practice (CoP)
- Support the broad range of technical ability in the CoP
- Guide new users with multiple vignettes
- Provide better options for managing user credentials

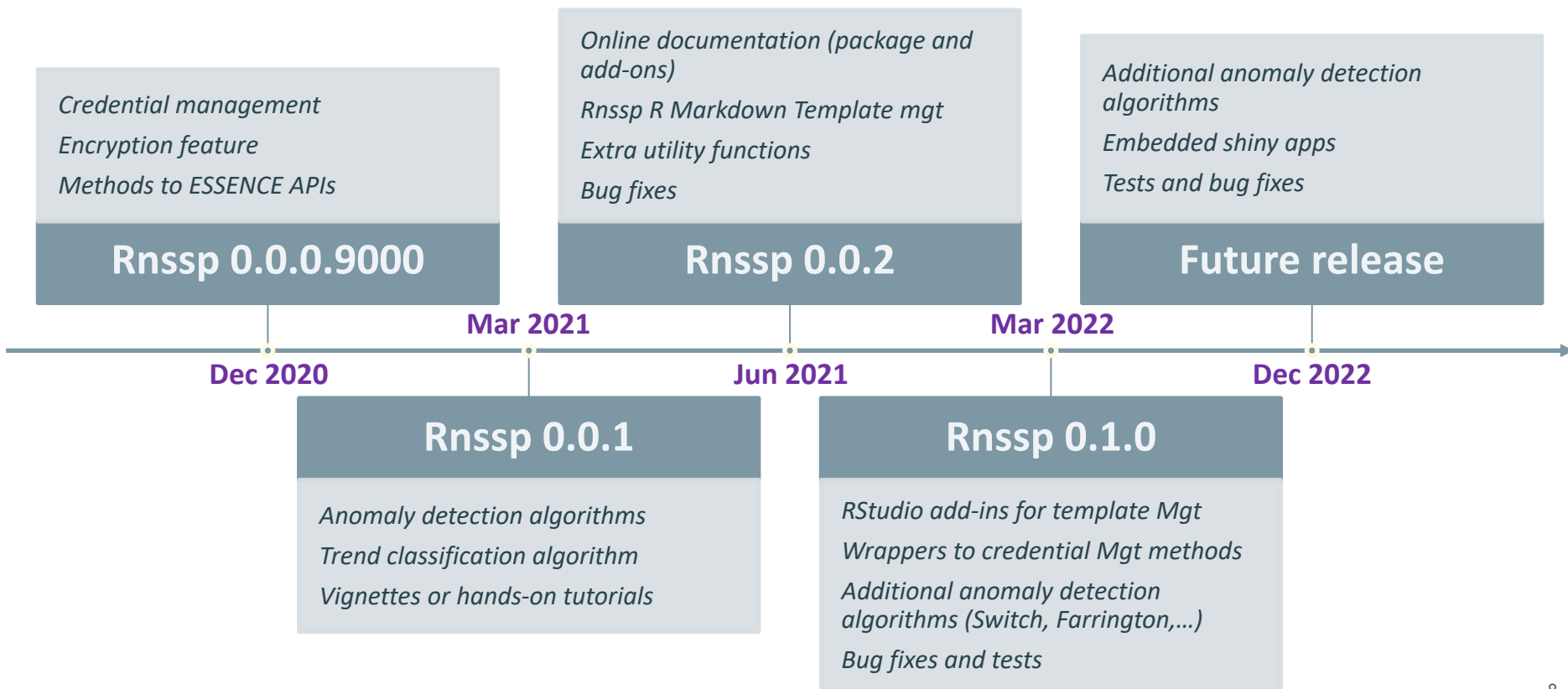
Why an R Package for NSSP?

- Streamline analytic tools
- Provide secure access to NSSP-ESSENCE application programming interfaces (APIs)
- Use ESSENCE APIs to support greater interoperability with other apps
- Improve collaboration by sharing report templates, scripts, and other NSSP resources

Focus Areas

From Rnssp 0.0.0.9000 to Rnssp 0.1.0

Product Timeline and Releases



Exported Functions and Classes

[`add\_rmd\_template\(\)`](#)

Utility to Add a New RMarkdown Template

[`alert\_ewma\(\)`](#)

Exponentially Weighted Moving Average (EWMA)

[`alert\_farrington\(\)`](#)

Farrington Temporal Detector

[`alert\_mar\(\)`](#)

Adaptive Multiple Regression (DEPRECATED!)

[`alert\_regression\(\)`](#)

Adaptive Multiple Regression

[`alert\_switch\(\)`](#)

Regression/EWMA Switch

[`askme\(\)`](#)

Password Prompt Utility

[`change\_dates\(\)`](#)

Utility to Change the Start and/Or End Dates in an ESSENCE API URL

[`classify\_trend\(\)`](#)

Trend Classification for Proportions/Percentages

[`clean\_text\(\)`](#)

Removes stopwords and common patterns of Chief Complaints

[`Credentials`](#)

A `NSSPCredentials` Class Representing a Credentials object

[`get\_api\_data\(\)`](#)

Get ESSENCE API data

[`get\_api\_response\(\)`](#)

Get ESSENCE API response

[`get\_api\_tsgraph\(\)`](#)

Get ESSENCE API Time Series Graph

[`list\_templates\(\)`](#)

List Available Report Templates

[`NSSPContainer`](#)

A `NSSPCredentials` Class to store a value in a container object

[`remove\_rmd\_template\(\)`](#)

Utility to Remove an Existing RMarkdown Template

[`Rnssp`](#)

Tools, Functions, Shapefiles data, and Rmarkdown templates to work with Syndromic Surveillance data via NSSP ESSENCE

[`Rnssp\_vignettes\(\)`](#)

Browse Rnssp vignettes

[`webscrape\_icd\(\)`](#)

ICD Code Web Scraper

Available Datasets

```
data(package = "Rnssp")
```

<u>cbsa_sf</u>	US Core-Based Statistical Area Shapefile
<u>county_sf</u>	US Counties Shapefile
<u>hhs_sf</u>	US Health and Human Services Regions Shapefile
<u>hsa_sf</u>	US Hospital Service Area Shapefile
<u>state_sf</u>	US States Shapefile
<u>territories_sf</u>	US Territories Shapefile
<u>tribal_sf</u>	US Native American Lands Shapefile
<u>rnssp_stopwords</u>	Rnssp Stopwords

```
?state_sf # View documentation for state_sf dataset
```

Focus Areas

- Provide better options for managing user credentials
- Secure access to NSSP-ESSENCE APIs

Secured Credentials Setup and Data Pull Interface

Credentials class:

- `$new(username, password)` to create a new NSSP user profile
- `$get_api_response(url)` to get API response from ESSENCE
- `$get_api_data(url, fromCSV = FALSE, ...)` to pull API data from ESSENCE
- `$get_api_tsgraph(url)` to specifically pull ESSENCE time series graph and API response

NSSPContainer class to store encrypted information in a container object

Wrappers to Data Pull Interface Methods

Credentials class:

- `create_profile(username, password)` (available as of next release)
- `get_api_response(url, profile = myProfile)` to get API response from ESSENCE
- `get_api_data(url, fromCSV = FALSE, profile = myProfile, ...)` to pull API data from ESSENCE
- `get_api_tsgraph(url, profile = myProfile)` to specifically pull ESSENCE time series graph and API response

Secured Credentials Setup

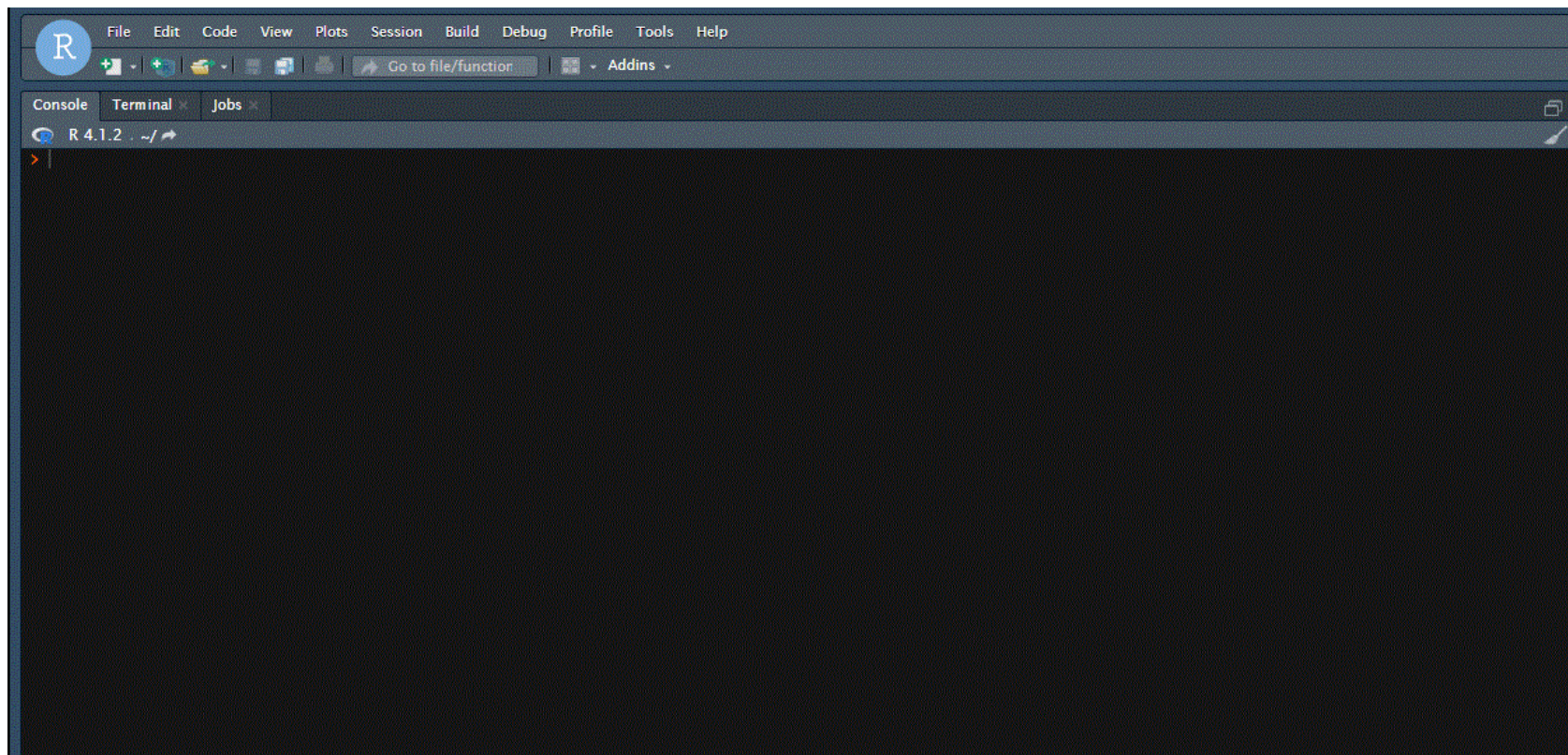
```
library(Rnssp)
# Rnssp encrypts your credentials and hides it into the `myProfile` object
myProfile <- Credentials$new(
  username = askme("Enter your username"),
  password = askme()
)
```

As of next release, the `create_profile()` function will be available for credential setup.

```
myProfile <- create_profile()
```

Secured Credentials Setup and Data Pull Interface

Setting Nssp Credentials



Secured Credentials Setup

```
myProfile # or str(myProfile)
```

```
<NSSPCredentials>
```

```
Public:
```

```
  clone: function (deep = FALSE)  
  get_api_data: function (url, fromCSV = FALSE, ...)  
  get_api_response: function (url)  
  get_api_tsgraph: function (url)  
  initialize: function (username, password)
```

```
Private:
```

```
  ..__: NSSPContainer, R6  
  ..password: NSSPContainer, R6  
  ..username: NSSPContainer, R6
```

Data Pull Interface (wrappers v methods)

```
# Get API response
api_response <- get_api_response(url)
# or api_data <- myProfile$get_api_response(url)

# Get API data (JSON URL)
api_data_json <- get_api_data(json_url)
# or api_data <- myProfile$get_api_data(url)

# Get API data (CSV URL)
api_data_csv <- get_api_data(csv_url, fromCSV = TRUE)
# or api_data <- myProfile$get_api_data(url, fromCSV = TRUE)

# Time Series Graph from ESSENCE
api_data_graph <- get_api_tsgraph(graph_url)
# or api_data <- myProfile$get_api_tsgraph(url)
```

Focus Areas

Improve collaboration by sharing report templates, scripts, and other Nssp resources

Report Templates



<https://github.com/CDCgov/Rnssp-rmd-templates>

```
# List available templates
```

```
list_templates()
```

```
# List available templates info as table
```

```
list_templates(as.table = TRUE) %>% View()
```

```
# Adds `text_mining` template to current Rnssp installation
```

```
add_rmd_template(template_name = "text_mining")
```

```
# Remove `state_ed_report` template from current Rnssp installation
```

```
remove_rmd_template("state_ed_report")
```

New R Markdown

- Document
- Presentation
- Shiny
- From Template

Template:

? Using R Markdown Templates

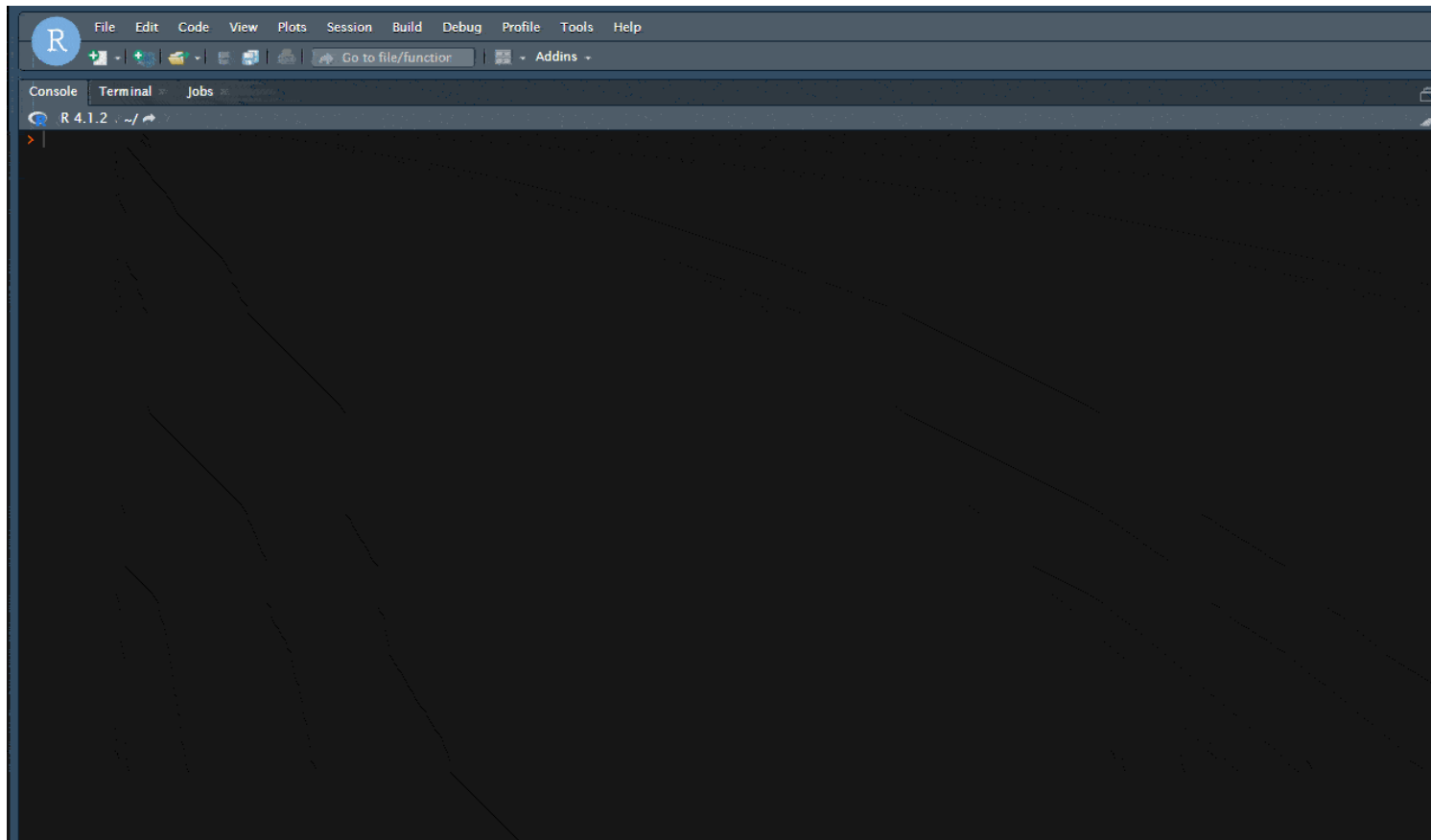
State Emergency Department Report	{Rnssp}
ED ICD-10 Category Volumes	{Rnssp}
Essence CCDD Categories Trends	{Rnssp}
Text Analysis Interactive Dashboard	{Rnssp}
Distill Article	{distill}
Flex Dashboard	{flexdashboard}
ggformula fancy	{ggformula}
Lightweight and Pretty Document	{prettydoc}

Create Empty Document

OK

Cancel

Report Templates

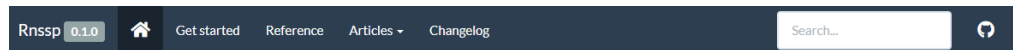


Focus Areas

Support technical capacity building with the
Community of Practice of NSSP

Rnssp Package Online Documentation

Online Documentation available at: <https://cdcgov.github.io/Rnssp>



Rnssp



Overview

The **Rnssp** R package is a catalog of data processing and analytics tools, templates, and functions commonly used across the National Syndromic Surveillance Program at the Centers for Disease Control and Prevention (CDC). Its goal is to improve code reproducibility, standardize and document reusable functions, facilitate the sharing of routine reports across the NISP Community of Practice (CoP), and better engage the NISP CoP.

Installation

You can install the development version of **Rnssp** from GitHub:

```
# install the Rnssp package
devtools::install_github("cdcgov/Rnssp")
```

Usage

This is a basic example which shows you how to:

- use the **Rnssp** package to create an NISP user profile
- and use the NISP user profile to pull data from ESSENCE via the ESSENCE API

```
library(Rnssp)

## Creating an NISP user profile
myProfile <- Credentials$new(
  username = askme("Enter your username: "),
  password = askme()
)

## Inspect your 'myProfile' confirming that username and password are completely hidden
myProfile
```

Links

Browse source code at
<https://github.com/CDCgov/Rnssp/>

Download build release at
<https://github.com/CDCgov/Rnssp/releases/>

Report a bug at
<https://github.com/CDCgov/Rnssp/issues>

Rnssp Templates Documentation at
<https://cdcgov.github.io/Rnssp-rmd-templates>

License

Apache License (>= 2)

Community

[Contributing guide](#)

[Code of conduct](#)

Developers

Gbedegnon Roseric Azondekon

Author, maintainer

Michael Sheppard

Author, contributor

Dev status

Rnssp Pipeline **passing**

repo status **Active**

lifecycle **stable**

DOI [10.5281/zenodo.6361350](https://doi.org/10.5281/zenodo.6361350)

CRAN **not published**

Rnssp_vignettes()

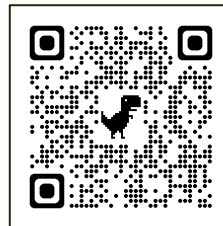
All vignettes

[Introduction to the Rnssp package](#)

[Using Rnssp RStudio Addins](#)

[Text Mining Example](#)

[Anomaly Detection and Trend Classification](#)



NSSP R Markdown Template Documentation

Online Documentation available at: <https://cdcgov.github.io/Rnssp-rmd-templates>



RMD Templates

Usage

Available Templates

Posts

MORE

- GitHub repo
- Change Logs
- Rnssp Package Doc
- Credits
- Tags

Clear History

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[Intro](#) [help](#) [home](#) [Rnssp](#)

RNSSP R MARKDOWN TEM

This catalog of [Rnssp R Markdown Templates](#) has been created by the developers of the [Rnssp R package](#) in collaboration with the [National Syndromic Surveillance Program \(NSSP\)](#).

Our goal is to make a wide collection of report templates accessible and easily distributable via the [Rnssp R package](#).

This online documentation serves as a repository of support material for [NSSP](#) members. This documentation provides:

- Instructions on how to add, use, and remove a template from an existing Rnssp R package installation;
- detailed description of each template; and
- blog posts on various topics related to R Markdown templates.

POSTS

- [Knitting With Parameters](#)
- [How to Pull CCDD Category List from NSSP-ESSENCE](#)

If you encounter a bug using the templates, we encourage you to email the author at gazondekon@cdc.gov or file an issue

USAGE

Learn how to dynamically extend your existing Rnssp installation with Rnssp R Markdown templates.

- [Requirements](#)
- [List available templates](#)
- [Add a template](#)
- [Manually add a template](#)
- [Remove a template](#)
- [Manage templates with Rnssp addins](#)

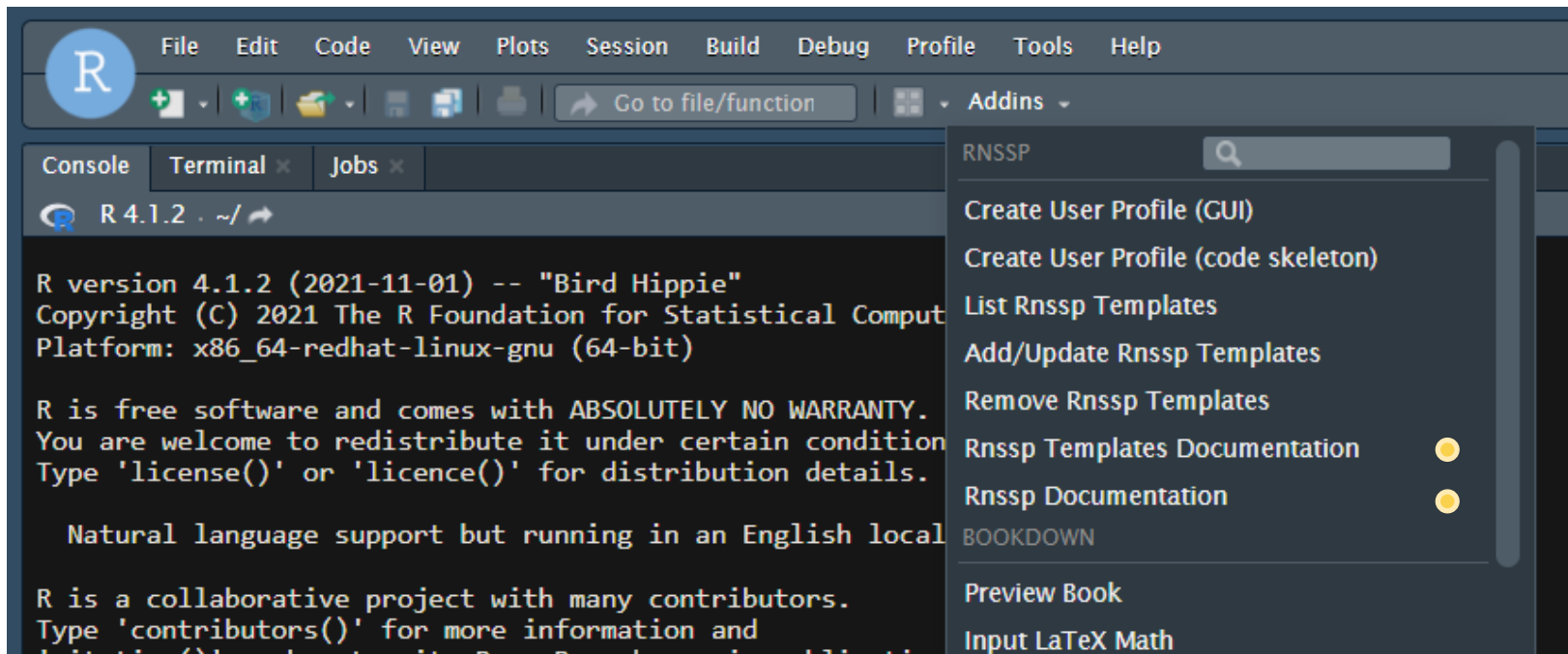
AVAILABLE TEMPLATES

Explore and learn how to use the Rnssp R Markdown templates.

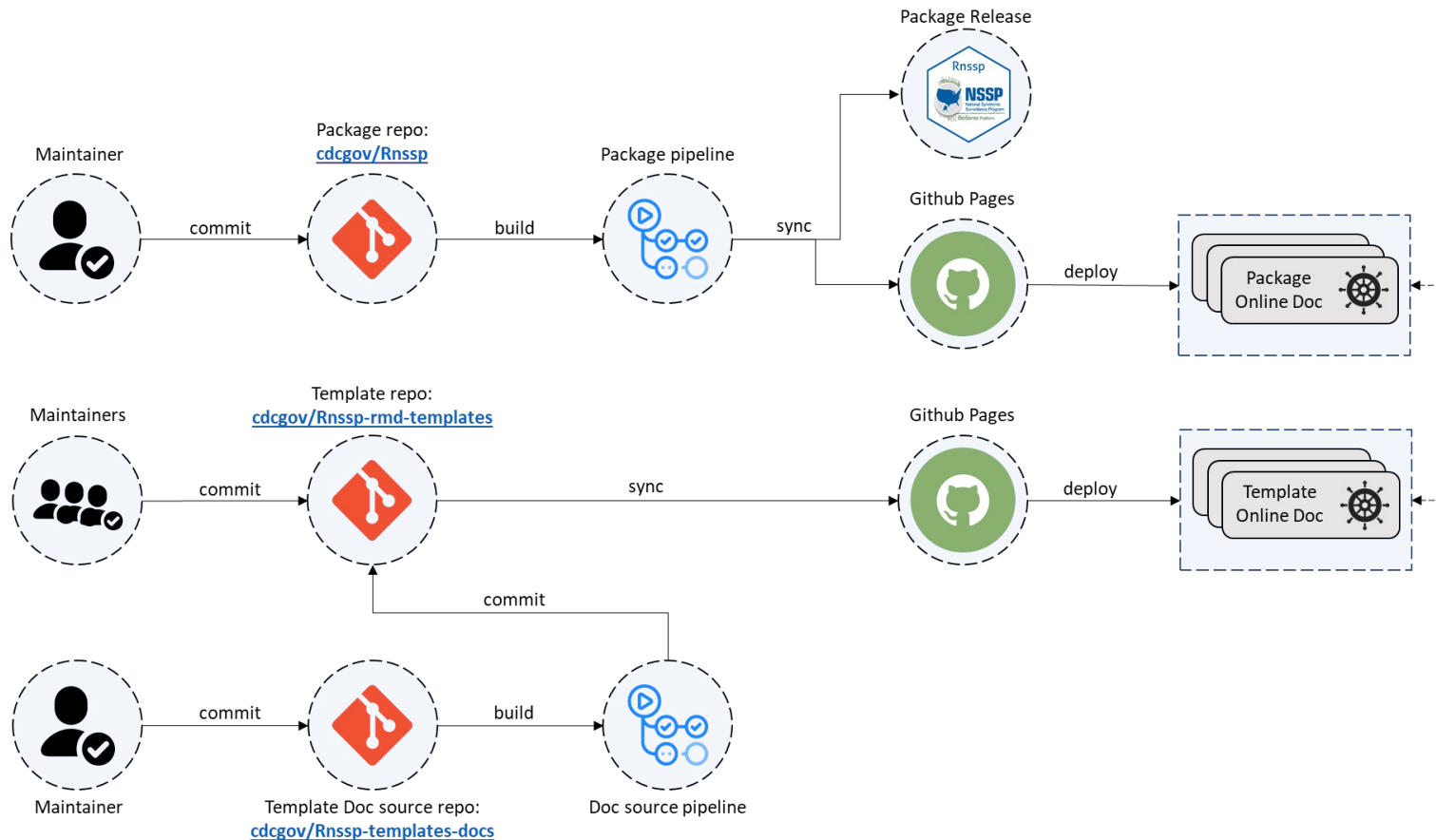
- [State Emergency Department](#)
- [Text Analysis Dashboard](#)
- [ESSENCE CCDD Categories](#)
- [ED ICD-10 Category Volumes](#)
- [Syndrome Definition Evaluation](#)
- [Word Alerts Report](#)
- [Data Quality Filter Matrix](#)



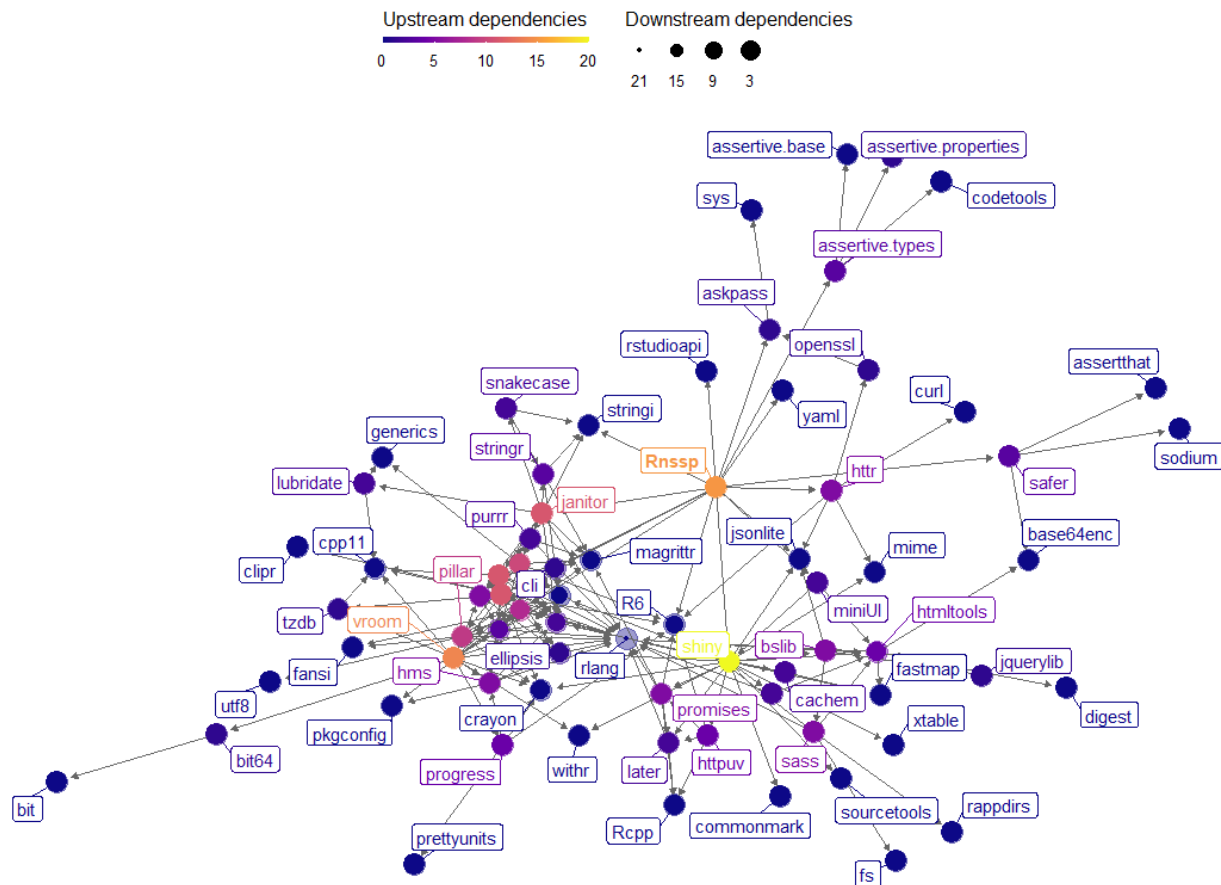
Online Documentations from RStudio



Continuous Integration/Continuous Deploy



Package Dependency



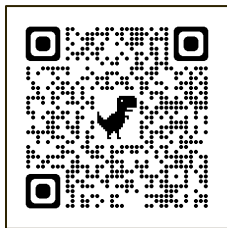
Package Installation

```
# Rnssp package installation
devtools::install_github("cdcgov/Rnssp")

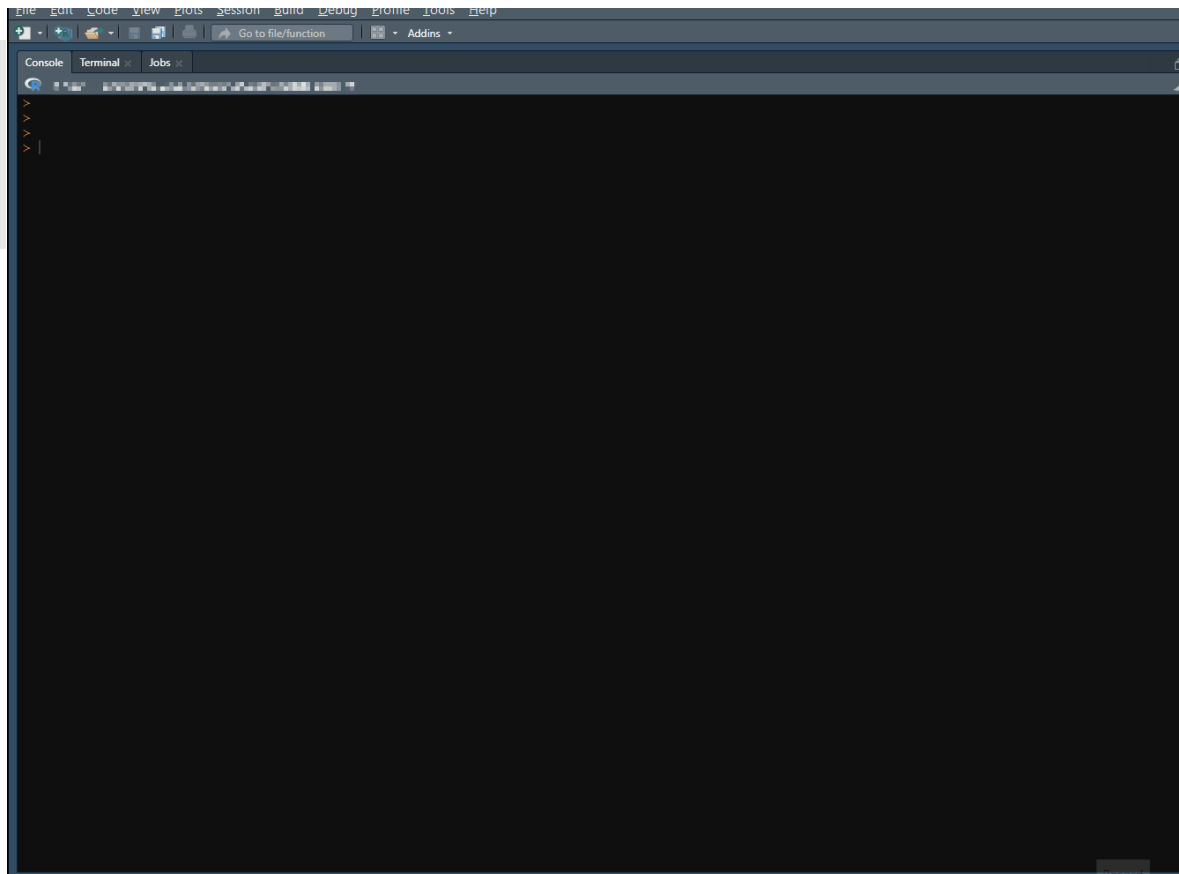
# Alternatively...
remotes::install_github("cdcgov/Rnssp")
```



<https://github.com/CDCgov/Rnssp>



Rnssp Pipeline passing
repo status Active
lifecycle stable
DOI [10.5281/zenodo.6361350](https://doi.org/10.5281/zenodo.6361350)
CRAN not published



Thank you!

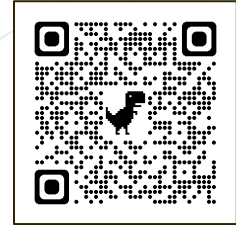


rosericazondekon.github.io



gazondekon@cdc.gov

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov



Live Rnssp Demo at:
<https://vimeo.com/656315112>



The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.



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Using of R and R Markdown for the Development of a Syndromic Surveillance Injury Dashboard

*** Sandra Gonzalez, PhD, MPH ^{1,2}, * Christopher Austin, MS ^{1,2}, and Ming Qu, PhD ¹**

¹Division of Public Health, Nebraska Department of Health and Human Services

²College of Education and Human Sciences, University of Nebraska-Lincoln

***Presenting Authors**



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Background

- Drug overdoses, motor vehicle crashes and suicide attempts are major public health burdens.
- Syndromic surveillance (SyS) can provide actionable information that can help public health surveillance programs to monitor trends and identify spikes, and thus facilitate a timelier public health response.

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Objective

- To create a dashboard to enhance the visualization and distribution of charts and tables displaying injury trends.

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Why we do this?

- Data on this dashboard will be automatically updated, thus providing a source of timely actionable information to support state and local injury prevention efforts.
- Timely data will be available to surveillance staff even if they do not have the skills to work with ESSENCE.
- Restricted user access will help meet Nebraska Department of Health and Human Services (NEDHHS) data sharing legal requirements for SyS.

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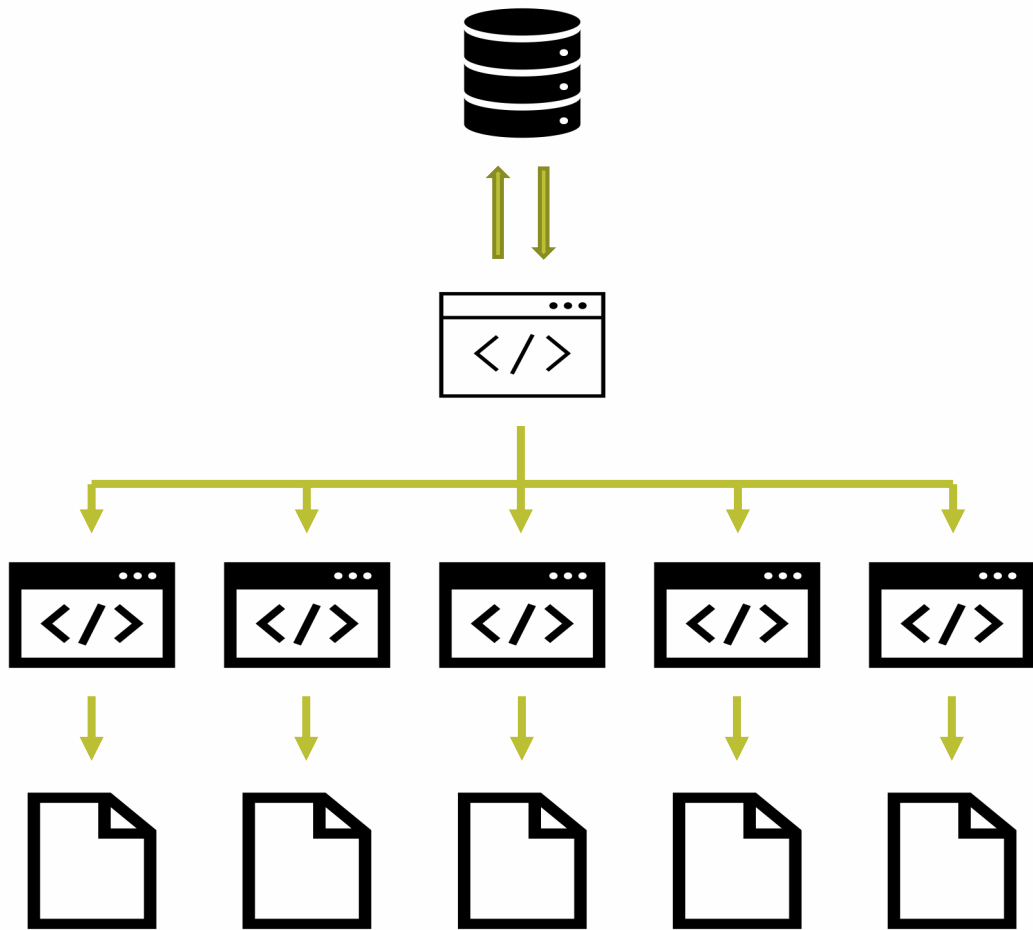
Methods

- R script will query ED data from a local ESSENCE instance (SQL server).
 - Aggregate data by MonthYear and local health department (LHD) using queried ED data.
 - Build tables using aggregated data.
 - Create a loop using Render(...) function from Rmarkdown package to make HTML outputs

```
for (x in LHD) {  
  input <- paste0(x, ".Rmd")  
  filename <- paste(format(Sys.Date(), format="%b%Y"), "_", LHD, "_OD_Report.html", sep='')  
  rmarkdown::render(input,  
                    envir = .GlobalEnv,  
                    output_file = filename,  
                    output_dir = "FILE DIRECTORY")  
}
```

- A Rmd file for each LHD filters the corresponding LHD data to display LHD specific ED data.
- Use Task Scheduler to run the R script beginning of each month to automate the process. Files are outputted to a pwd protected datamart folder.

Methods



Local ESSENCE instance

R Script

- Create a loop using Render function

R Markdown Scripts for each LHD

- Each Rmd script filters for specific LHD

HTML Dashboard outputted to
pwd protected datamart folder

Key Packages

flexdashboard
DBI
odbc
DT
Plotly
Rmarkdown
Knitr

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Results

Report notes

Syndromic Surveillance of Overdose Related Emergency Department Visits in Nebraska

Reporting date: September 02, 2022

This report focuses on:

Indicators related to opioid overdose (OD) related emergency department (ED) visits during January 1st, 2017 August 31, 2022.

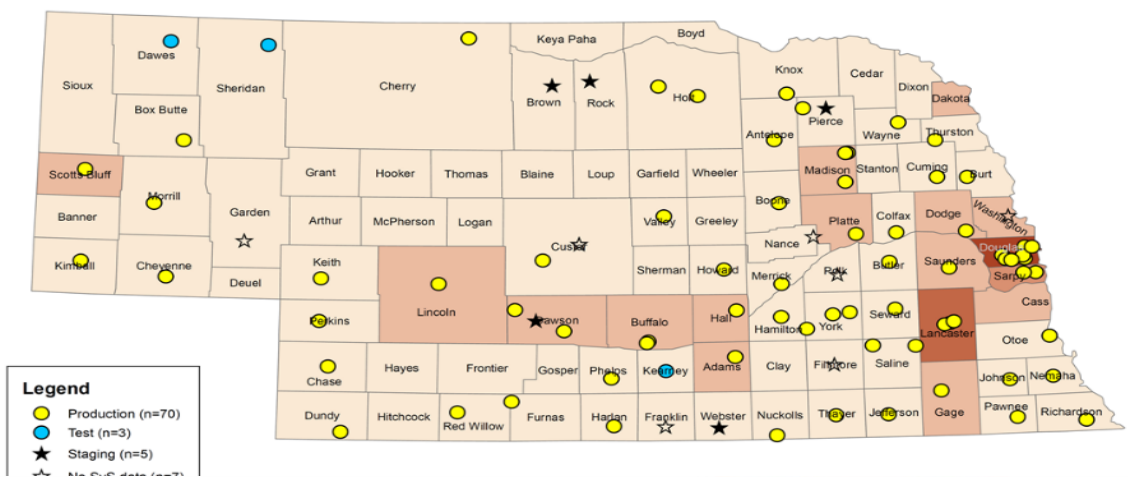
We used ICD10-CM syndromic surveillance definitions to identify OD-related ED visits in syndromic surveillance data.

*Results are preliminary and may change as more data is received.

ED visits from 70 facilities located in 54 counties throughout the state, as indicated in the map below.

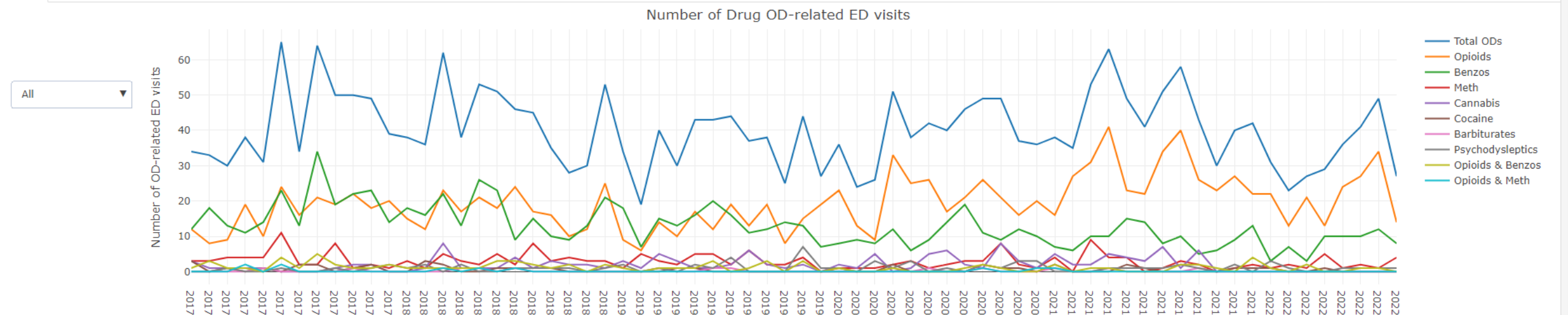
Data analyzed by hospital LHD location.

Geographic Distribution of Nebraska Syndromic Surveillance ED Target Facilities (n=85) and County Populations — September, 2021



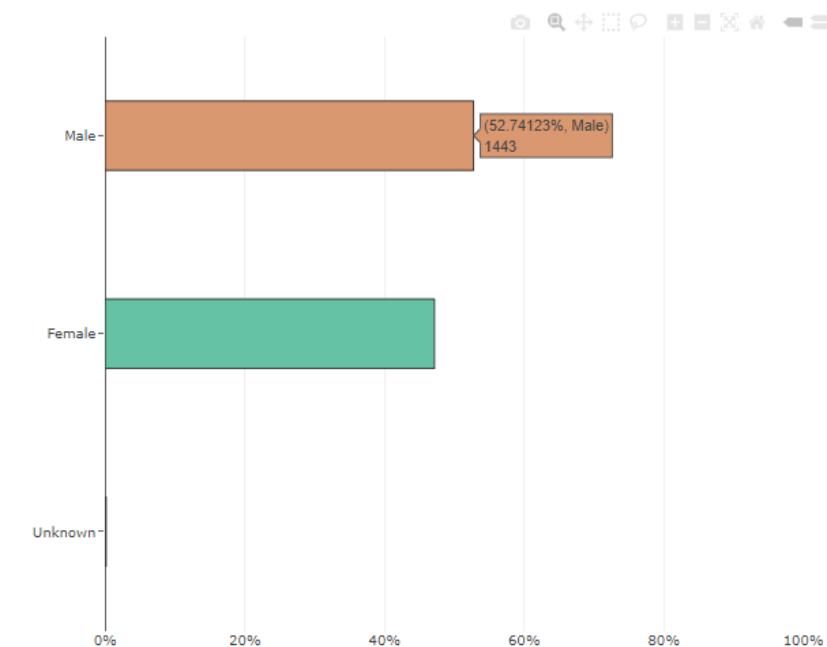
Results

MonthYear	Total_ODs	Opioids	Opioids_percent	Meth	Meth_percent	Cocaine	Cocaine_percent	Cannabis	Cannabis_percent	Barbiturates	Barbiturates_percent	Benzos	Benzos_percent
2022-08	27	14	52%	4	15%	0	0%	0	0%	0	0%	8	30%
2022-07	49	34	69%	1	2%	0	0%	0	0%	0	0%	12	24%
2022-06	41	27	66%	2	5%	0	0%	0	0%	0	0%	10	24%
2022-05	36	24	67%	1	3%	0	0%	0	0%	0	0%	10	28%
2022-04	29	13	45%	5	17%	1	3%	0	0%	0	0%	10	34%
2022-03	27	21	78%	1	4%	0	0%	0	0%	0	0%	3	11%
2022-02	23	13	57%	2	9%	0	0%	0	0%	0	0%	7	30%
2022-01	31	22	71%	1	3%	1	3%	0	0%	0	0%	3	10%
2021-12	42	22	52%	2	5%	1	2%	0	0%	0	0%	13	31%
2021-11	40	27	68%	1	2%	1	2%	0	0%	0	0%	9	22%

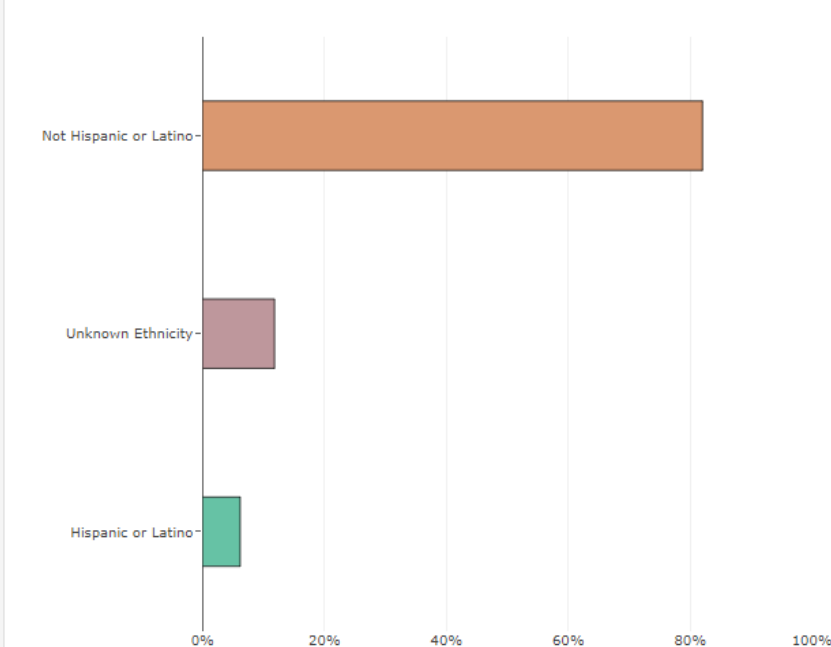


Results

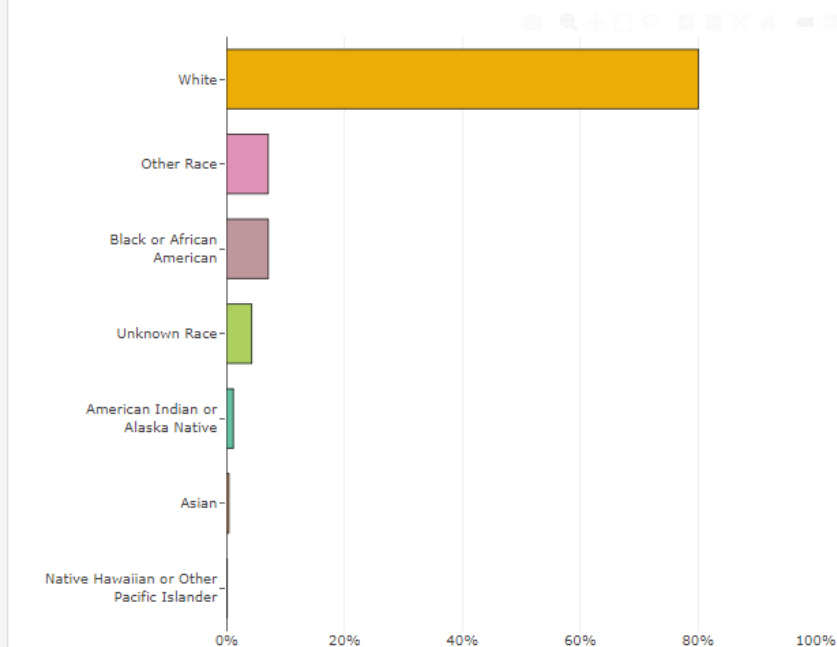
Percent of total overdose related ED visits by sex



Percent of total overdose related ED visits by ethnicity



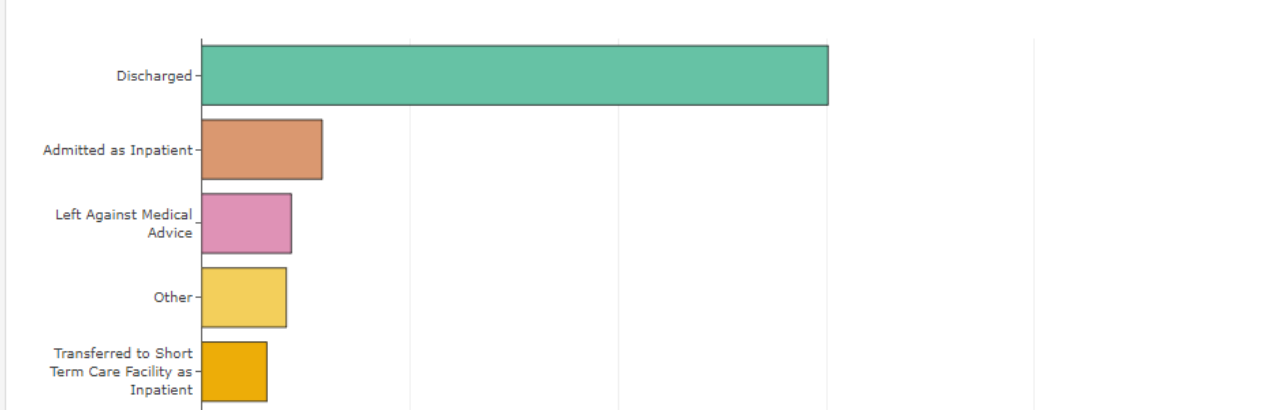
Percent of total overdose related ED visits by race



Percent of total overdose related ED visits by age group



Percent of total overdose related ED visits by discharge disposition



DEMO

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Conclusions

- The dashboard allows LHD staff to interactively query surveillance data in a timely manner and improve surveillance efficiency and effectiveness.
- This project will help strengthen collaboration with NEDHHS surveillance programs, and LHDs.
- Moreover, this project will help enhance NEDHHS' data science workforce and capacity to address the urgent needs for the surveillance and prevention of injuries related to drug overdoses, motor vehicle crashes, and suicide attempts.

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Acknowledgements

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- Kevin Cueto
- David Loyall
- Mark Watson

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- CSTE Injury Data Science Subaward
 - CDC cooperative agreement number: 1 NU38OT000297-003-00

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NebraskaDHHS



@NEDHHS

dhhs.ne.gov

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NebraskaDHHS



@NEDHHS

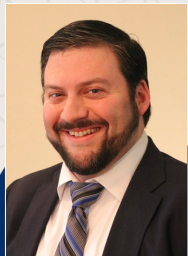
dhhs.ne.gov

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Lauren Gracy, MPH

Kansas Department of Health and Environment



Using R markdown to Develop a Comprehensive, Syndrome-based Dashboard for Public Health Practice in Kansas

Kansas DSTT Team | December 7, 2022

About CSTE's Data Science Team Training (DSTT) Program

Program Overview

- Designed to increase the public health work force knowledge of data science and data modernization
- Yearly, 12-month program. One team from each jurisdiction is accepted
- 2nd year cohort - meant to address CDC's data modernization initiative

KS Team Members

- Jason Geslois
- Lauren Gracy
- Gabe Haas
- Jade Hodge
- Scott Johnston
- Danielle Sass – Project Supervisor

Present Cohort Projects

Kansas: Developing a surveillance tool to define vulnerable populations associated with evolving health threats >

Minnesota Department of Health COVID-19 Dashboard to Monitor Emerging Threats >

Geospatial Analysis, Surveillance, and Cluster Detection for Select Enteric Diseases in New York State >

Texas: Developing a Dashboard Framework for Reporting Maternal and Child Health Data >

Establishing A Centralized Communicable Diseases Dashboard for the US Virgin Islands >

Developing a dashboard to identify and visualize COVID-19 cases and outbreaks in high-risk correctional congregate settings in Washington State >

Wisconsin: Enhancement of Occupational Surveillance through Electronic Case Reporting and Data Capture >

What is ESSENCE?

- Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE)
 - Housed under the CDC's National Syndromic Surveillance Program (NSSP)
- Captures 98% of total Kansas Emergency Department (ED) visits within 24 hours of patient admission
- ESSENCE allows users to visualize ED visit trends for hundreds of predefined Syndromes
 - Raw data processed, calculated fields created, and records combined into a single visit
 - Diagnosis codes, ICD9/10 and SNOMED, plus free-text analysis of Chief Complaint are used to categorize patients into Syndromes
- Rich data source including 196 fields: patient demographics, diagnosis codes, triage notes, geographic area, smoking status, height/weight, etc.
- NSSP's BioSense Platform includes a Suite of tools to help with data analyses
 - Using NSSP's RStudio Server & ESSENCE Application Programming Interface (API), Syndromic data can be accessed without opening the ESSENCE interface

DSTT Kansas Team Process

1. Brainstorming and Determining Measures of Interest

- Weekly Meetings throughout the year
- Explored ESSENCE fields
- Looked at other types of analysis/visualization projects
- Narrowed down our focus

2. Learning R

- Collaborated in NSSP RStudio and Github
- Used Coursera, KDHE R Users Group meetings and office hours, NSSP contacts, DSTT Coach to learn and develop skills

3. Connecting to ESSENCE API and Creating Graphs

- Connected to the ESSENCE API to directly pull queried data
- Initially worked in a Rmarkdown file to create a pdf report

4. Upgrading report to flexdashboard

- Developed into a flexdashboard – an interactive dashboard that can quickly visualize queried data
- Flexible and fast

Purpose of This Tool

- Near Real-Time
- Interoperable
- Trend detection
- Determine populations most affected (Ex: Air-Quality)
- Questions we addressed that one might want to ask about the data
 - Which age group is most affected?
 - Are there disparities in who is presenting to the Emergency Department?
 - Where in the state is being most affected and when?
 - Are we also seeing an increase in specific diagnosis codes? Ex: Are asthma-related discharge diagnosis codes related to air-quality increasing over time?
 - Are there any related syndromes developing alongside the query of interest?
- More usability for non/infrequent ESSENCE user

Demonstration

Query Pull Date – Sun – Sat

Use Case 1 – Respiratory

- COVID-19
- Flu
- RSV

Knit with Parameters

NSSP Username:

lgracy01

NSSP Password:

.....

Select Age Group

CDC ILI Reporting Age Groups

Syndrome Definition:

CCDD CDC COVID-Specific DD v1

Comparison Syndrome 1:

CCDD CDC Influenza DD v1

Comparison Syndrome 2:

CCDD CDC Respiratory Syncytial Virus v1

Enter Start Date:

2022-09-03

Enter End Date:

2022-11-05

Map Selection:

County View

☒ Has Been Emergency:

Cancel Knit

Technical Notes

Query Category: CCDD CDC COVID-Specific DD v1

Time Frame: 2022-09-03 to 2022-11-05

Report Date: 2022-11-15

Data Source:

Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE), Kansas
Syndromic Surveillance System, Kansas Department of Health and Environment

The Kansas Syndromic Surveillance Program (KSSP) quickly collects information from hospital emergency department (ED) and urgent care clinic visits. This provides KDHE, hospitals and local health departments insight into rapidly changing health conditions in the state. This data is used to describe emerging public health threats and enable the healthcare community to quickly identify health issues and take action to prevent injury and illness. About 98% of all Kansas ED patient visits each year are included in this data. These data are preliminary are not to be shared outside of approved use.

Analysis Definitions:

Trend increase/decrease - weekly count of visits compared to previous 4 week mean; significantly decrease = weekly count less than 2 standard deviations below the mean, slight decrease = weekly count less than one standard deviation below mean & greater than two standard deviations below mean, no change = between one standard deviation below mean and one above the mean, slight increase = greater than one standard deviation above mean and below two standard deviations above mean, significant increase = greater than two standard deviations above mean

Tab Details:

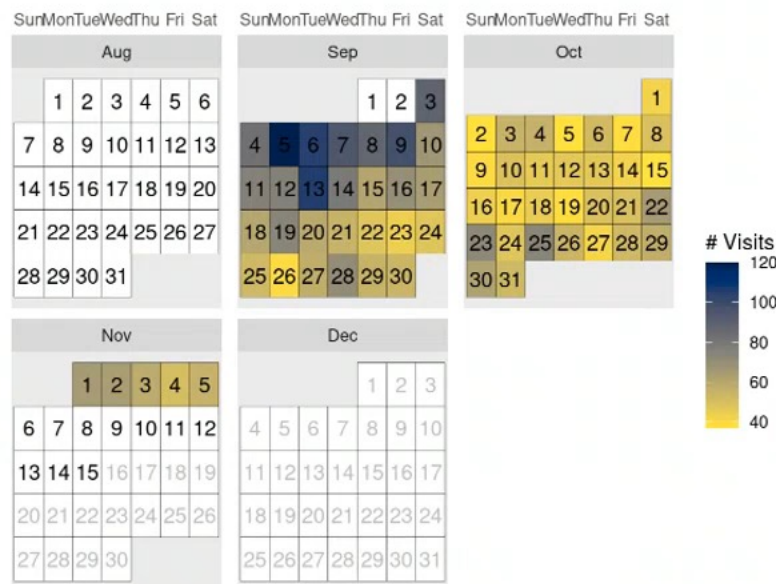
Demographic Snapshot - Looks at age groups and race/ethnicity

Trends - Provides changes over time including age and sex along with significant changes over time

Map Comparison - Provides an interactive map to look at visit counts and rates across county or zip code tabulated area

Map Over Time - Shows a transition of the amount of records coming in at the county level mapped over time

Visits by date



Jason Geslois [KDHE]



Lauren Gracy

Future

- **For Other Epis**
 - Sharing R project for testing additional use cases & requesting feedback on usability and the needs of specific user groups
- **For Programs**
 - Sharing data for situational awareness and public health action
- **For Adding Future Capabilities**
 - Creating a report version (pdf) for sharing with partners
 - Adding ability to type out user designed queries
 - Adding predictive analytics and spatial statistics bringing in external data for additional insights
 - Assessing additional ESSENCE metrics measuring statewide healthcare quality

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 - Scott Johnston
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- **National Syndromic Surveillance Program**
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 - Lakshmi Radhakrishnan
- **Kansas Department of Health and Environment**
 - Danielle Sass
 - Jaime Gabel
 - John Anderson & the internal R Users Group

Thank You/Questions



Contact Info

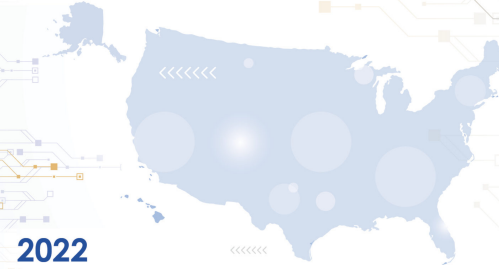
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National Syndromic Surveillance Program

Community of Practice

Resources that Advance the Science and
Practice of Syndromic Surveillance



2022

Syndromic Surveillance Symposium

December 6–8, 2022



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