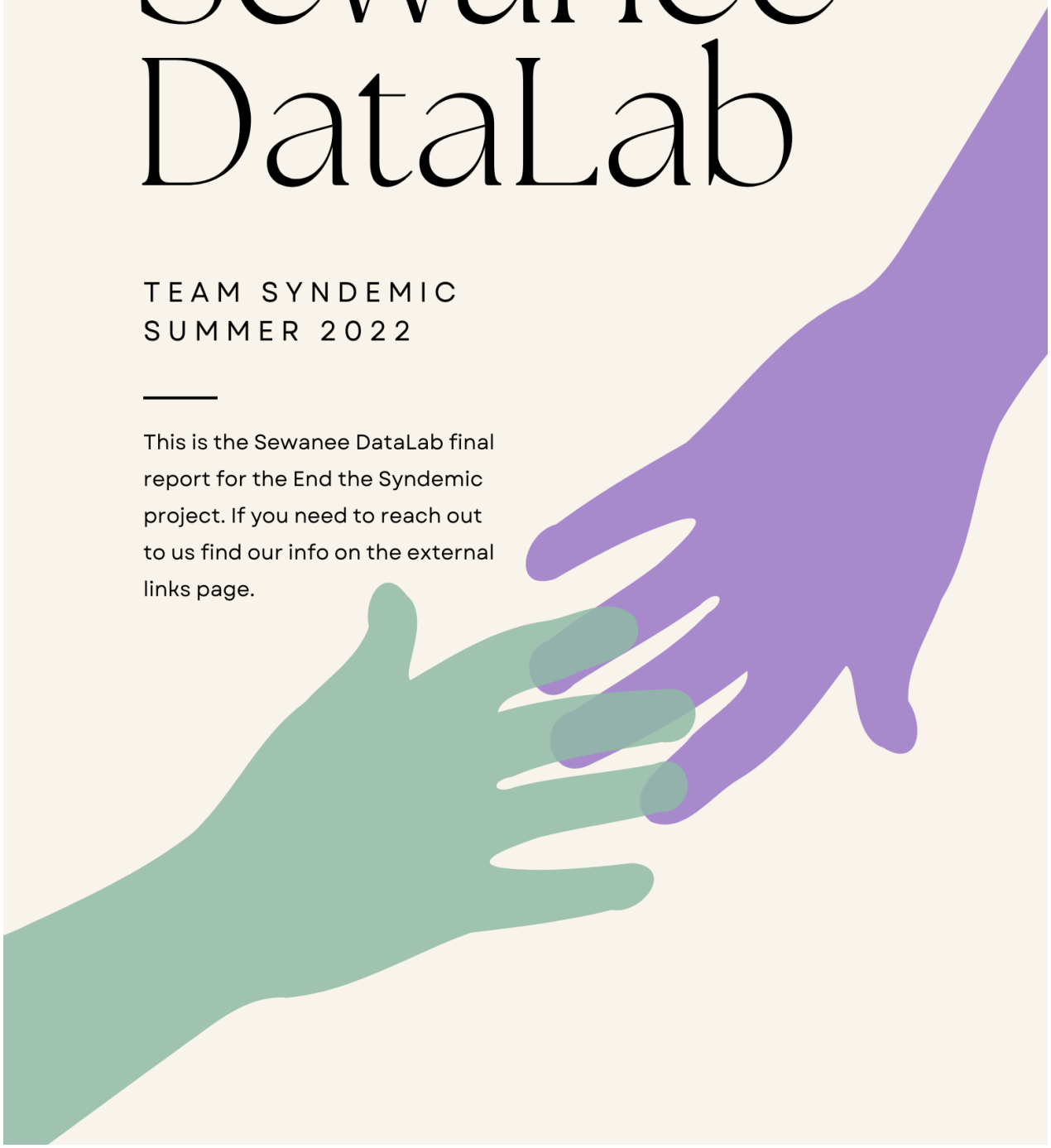
Sewanee DataLab

TEAM SYNDEMIC
SUMMER 2022

This is the Sewanee DataLab final report for the End the Syndemic project. If you need to reach out to us find our info on the external links page.



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Project Summary

Syringe sharing continues to increase the spread of HIV, viral hepatitis, STIs, and other fatal diseases, creating a syndemic and skyrocketing healthcare costs. From 2016 to 2018, the Michigan Department of Health and Human Services studied the association between the opioid epidemic and skin, soft-tissue, and venous infections (SSTVIs), endocarditis, sepsis, and osteomyelitis. Our partner within the CDC and the Tennessee Department of Health, Amber Coyne, worked with the Sewanee Datalab to create something similar to that study in Tennessee. Using 2019 Tennessee hospital discharge data, the Datalab is able analyze the socio-economic impact and connection between syringe-related substance use and illnesses.

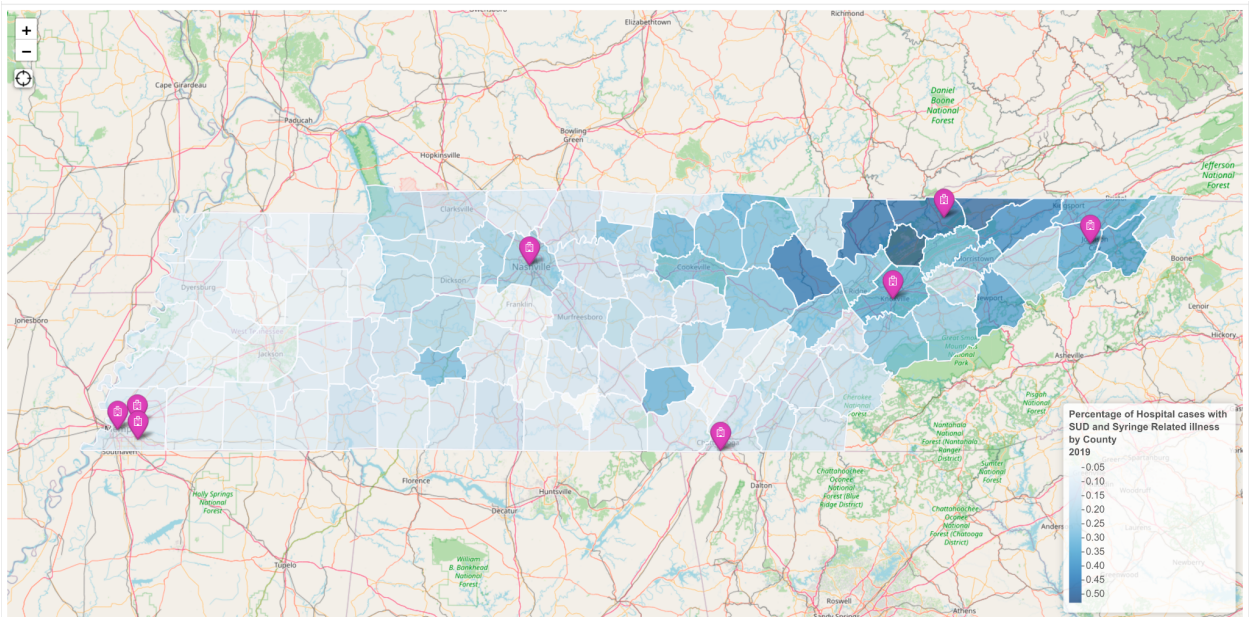
Background

The End the Syndemic movement has created an integrated plan that addresses HIV, sexually transmitted infections, substance use disorder, and viral hepatitis. Ending the HIV Epidemic plans have been sweeping across the nation for several years and many of these plans started as grassroots movements to make HIV prevention and treatment plans that reflected community priorities. To successfully end HIV in Tennessee, we must also address the overlapping epidemics heavily impacting our communities. One of these overlapping epidemics includes diseases we analyzed like endocarditis and many SSTVIs.

Client

During our time at DataLab, we worked with Miss Amber Coyne from the Center for Disease Control, who is now assigned to the Tennessee Department of Health; her work has been crucial to our own understanding of the project as well as how we planned our analysis. She is a public health advisor skilled in community engagement, strategic planning, and innovative program development. As part of her current assignment she manages seven regional planning groups of over 330 community partners including people directly impacted by the syndemic and organizations providing prevention and treatment services for HIV, sexually transmitted infections, substance use disorder, and viral hepatitis in Tennessee. As stated on the ETS website that she maintains, endthesyndemic.org, her main goal is “the creation of an ‘End the Syndemic (ETS)’ plan, which will be an integrated prevention and treatment blueprint for Tennessee… developed through meaningful community engagement.” Our analysis plays an impactful role in the creation of this blueprint by establishing associations between substance use and syringe-related illnesses. Our interactive dashboard will provide the ability for both community leaders and policy makers to quickly and easily understand the scope and cost of this part of the syndemic.

Area of Impact



Throughout the summer, our team was especially interested to learn how the syndemic impacted counties around Tennessee. The map above shows the location of all known syringe exchange programs as well as the percent of cases in each county that were part of the syndemic we examined. We were not surprised to see that the historically poor Appalachian region was affected heavily. What was surprising is that major cities like Nashville, Memphis, and Chattanooga were not hotspots for the syndemic if you're looking at the percentage of cases alone, and we believe that may be due in part to syringe exchange programs; exploring this would be an important avenue for future studies. Finally, it seemed that western Tennessee as a whole suffered less from the syndemic despite not having universal access to syringe exchange programs; understanding why this is could lead to solutions for the whole of Tennessee.

Data Description

The data being used by Syndemic is gathered from patient records from TN hospitals in 2019. Hospitals send patient discharge data to the TN Department of Health, and the TN Department of Health sells the data.

Variable Name:	*Variable Description:*
…1	Patient Number
File_Type	Whether they are *Inpatient* or *Outpatient*
Data_Yr	Year this data was collected
Hospital_ID	ID of Hospital
Patient_Zip	Zip Code of the patient
Patient_Sex	Patient Sex: F= Female M= Male U= Unknown
Patient_Discharge_Status	Patients' status when being discharged. Ex: 20: Expired
Rev_Cd1:23	This code identifies a specific

	accommodation, ancillary service, or billing calculation. The individual revenue code indicates that a part of the total charge claimed is categorized under a specific revenue source.
Tot_Chrg_by_Rev_Cd1:23	Total Charges pertaining to the related revenue code for the current billing period as reflected by the statement covers period. Total Charges include both covered and non-covered charges.
Total_Tot_Chrg	Give the total for all the Total Charges by Revenue Code Fields for the bill. This total should include both covered and non-covered charges.
Non_Cvrd_Chrg_by_Rev_Cd1:23	This data is used to properly analyze and to obtain a more valid comparison of non-covered hospital charges by revenue code.
Total_Non_Cvrd_Chrg	Give the total for all the Non-Covered charges for the bill.
Primary_Payer_Class_Cd	The name or type of payer

	organization from which the hospital first expects some payment for the bill. Ex: D: Medicaid M: Medicare
Secondary_Payer_Class_Cd	The name or type of payer organization from which the hospital might second expect some payment for the bill. Ex: D: Medicaid M: Medicare
Tertiary_Payer_Class_Cd	The name or type of payer organization from which the hospital might third expect some payment for the bill. Many bills will lack a third payer; this field will then be blank. Ex: D: Medicaid M: Medicare
National_Provider_Id	Provide the correct National Provider Identifier (NPI) number for the hospital that is associated with

	the type of services provided to the patient.
Diag1:18	The ICD-10-CM code is describing the principal diagnosis (i.e., the condition chiefly responsible for the admission of the patient for care).
Patient_Race_Ethnicity	Classified using 2 numbers. Patient's race/ethnicity and hispanic or non-hispanic. Ex: 1 White or Caucasian 2 Black or African American … 1: Hispanic Origin 2: Non-Hispanic Origin 3: Hispanic Origin Unknown
Age	Age of patient in years.
TN_Res_Flag	Whether or not they are a Tennessee Resident. Y: Yes N: No

Method

We emulated a study conducted in Michigan, where the association between the opioid epidemic and our four key diagnoses were analyzed to understand the social and economic costs. First, we calculated the infection rates using R to understand the risks that people suffering with substance use disorder (SUDs) face by comparing the prevalence of syringe-related illnesses amongst those suffering from SUDs versus the aggregate discharge population. Next, we analyzed the prevalence of disease by age group in those suffering from SUDs and the aggregate hospital population to understand how the age ranges affected by disease change depending on the use of substances. Last, we analyzed the amount of funds that are being spent on treating cases related to the syndemic. We first measured the amount of public vs private funds being spent as a whole on syndemic cases, and then we explored more into differences in privates vs public funding. Our data consisted of one year of data, 142 unique hospital IDs, and 5.4 millions rows with 265 columns that we cut down to 271,176 rows with 115 columns. We cut data to include solely for Tennessee residents, syndemic-related diagnoses, demographic data like age and race, costs of treatment, and the primary healthcare payor. Filtering the data by diagnoses was one of the most complex barriers we faced when cleaning the data. Due to the complexity of the diagnoses codes we received, we had to filter for codes that identically matched a pattern we were given, or started with a pattern we were given. This caused us to have to filter for these cases two different ways for each infection of interest.

Product / Outcome

Links to all of our products can be found on the *External Links* section.

The Dashboard

The primary goal of the project was to provide an online dashboard surrounding the syndemic. The Tennessee Department of Health already has a handful of dashboards on their main website, but none used the same information we had or were as neatly formatted as we hoped. Our dashboard provides an introductory homepage and glossary, examines major associations between substance use and key diagnoses, further explores its effects on different age groups, presents the cost of it all, provides an interactive map of the syndemic in Tennessee, and then shows a page about those of us involved. This layout is helpful to serving our two many target audiences: politicians and community members. The dashboard provides background information to update anyone regardless of their knowledge beforehand and also provides users the ability to dive deeper into the subject. Most importantly to us, the interactive map provides Tennesseeans the ability to see where and how they can get help as well as how their local area is affected by the syndemic.

The "One-Pager"

Inspired by the “CONSEQUENCES OF SUBSTANCE USE: INFECTIOUS DISEASES” article created during the study in Michigan, we wanted to provide a flyer that could easily and effectively update people on our work surrounding the Syndemic. It is laid out in three main categories: General Trends, Economic Impact, and Proven Intervention. The sections, in order, set up impactful trends and associations, provide scope for the economic impact this part of the syndemic has, and then directs readers to what we know about proven interventions in the form of syringe service programs.

The Data Sheet

Similar to the previously mentioned Michigan study, we provided a table that breaks down the data by common characteristics including: sex, race, ethnicity, age, disposition, payor, and total charge.

Future Goals

Throughout our analysis we ran into a handful of major avenues worth exploring in the future. First, we only had a year of data from 2019, so purchasing more data would allow a deeper exploration of the data than we were able to do. Next, we were able to find some studies supporting the Tennessee Department of Health's advocacy for syringe exchange programs, but none of them were based in Tennessee and the best of them were from the late 80's; securing or creating data on the effectiveness of syringe exchange programs in Tennessee would incredibly powerful alongside what we've already found here. Finally, our data suggests that western counties in Tennessee are not as heavily affected as eastern ones. This includes major cities like Memphis as well as rural areas; this is despite the lack of syringe exchange programs. Understanding why this is could provide a new path forward for fighting the syndemic.

The Team

Alan Kevin Espinoza (he/him) is a student at the University of the South from Houston, Texas. During his time at Sewanee, he has begun his major in Computer Science and Mathematics while working on being part of the 3-2 engineering program where after 3 years at Sewanee, he will do another 2 years studying Data Science at Washington University at St.Louis. On campus he is the President of the fraternity Gamma Sigma Phi, treasurer of the Hispanic Organization of Latino Awareness, helps his peers in the Academic Technology Center, and loves to rock climb in his free time. When he graduates, he intends to start his career as a data analyst or software engineer!

Jacob Herron (he/him) C'24 is a student at the University of the South from Rickman, Tennessee. During his time at Sewanee, he has started his major in economics and is working on a minor in mathematics. On campus, he can be found teaching new fencers at Fowler, catching up with friends and professors at Stirlings, or helping his peers at his job in the library. When he graduates, he intends to pursue a masters degree in economics
in hopes of working as an economist.

Delana Turner (she/her) C'24 is a student at the University of the South from Hyattsville, Maryland. At Sewanee, she is majoring in American Studies while minoring in Politics and earning a certificate in Civic and Global Leadership. On campus, she can be found working with the Roberson Project on Slavery, Race and Reconciliation and the Diabetes Prevention Program all within the Bonner Leader Program. When she graduates in 2024, she intends to pursue a career in public policy.

External Links

Github Wiki:

- A wiki for our deliverables and code

End the Syndemic Website:

- Our partners website

Sewanee DataLab Website:

- Our company website
  - Sewanee DataLab Website Syndemic Page:
    - Our page on the company website

External Research Used:

- Where we acquired external, supporting research from
  - An economic analysis of needle exchange and pharmacy-based programs to increase sterile syringe availability for injection drug users
    - doi: 10.1097/00042560-199802001-00021
    - The study we used for looking at the economic benefits of syringe exchange programs

Thank you!