

Navigating Data Linkages in Environmental Health Research with CHORDS: Connecting Health Outcomes Research and Data Systems

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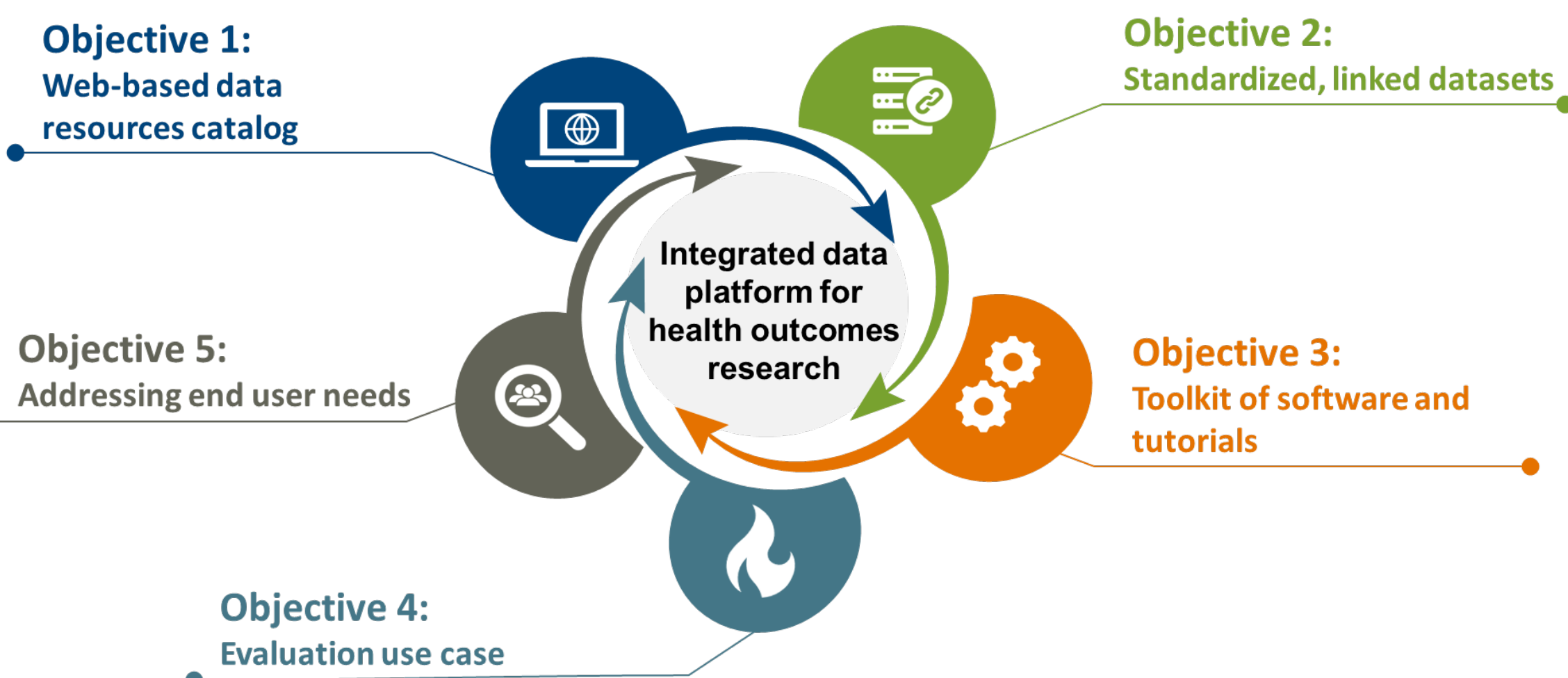
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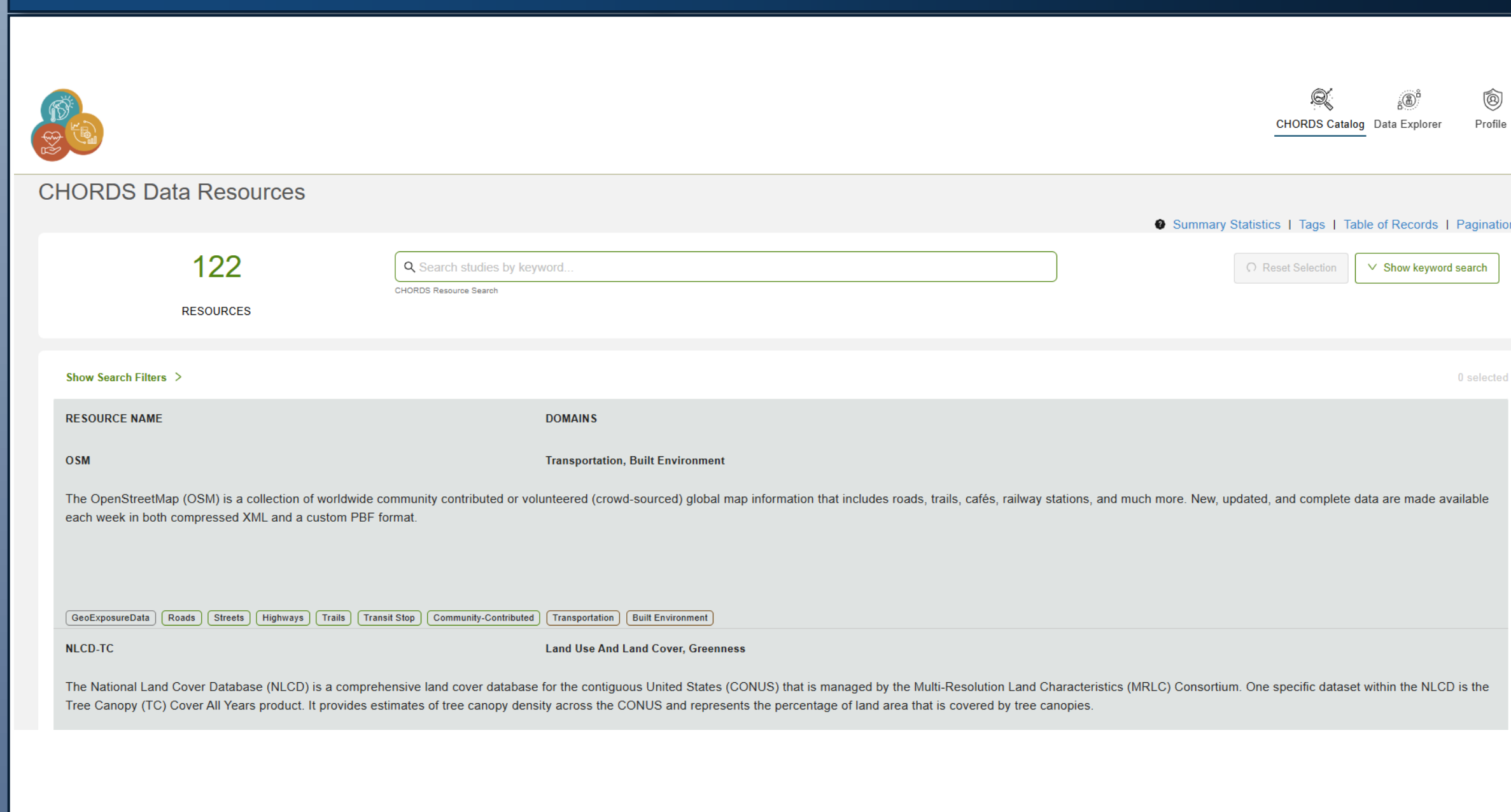
Background

The CHORDS project **strengthens data infrastructure to facilitate research connections** between environmental exposures and health outcomes. Exposures such as poor air and water quality, extreme temperatures, and natural disasters can cause both short-term health effects, like asthma attacks and heat stroke, and long-term conditions such as heart disease and cancer. By **providing accessible, interoperable data and analytical resources**, CHORDS supports researchers, health practitioners, and public officials in assessing environmental health risks, developing evidence-based interventions, and anticipating future health challenges to better protect communities.

CHORDS Objectives and Deliverables



Data Resources Catalog



CHORDS Data Resources

122 RESOURCES

Search studies by keyword

Summary Statistics | Tags | Table of Records | Pagination

Show Search Filters

RESOURCE NAME DOMAINS

OSM Transportation, Built Environment

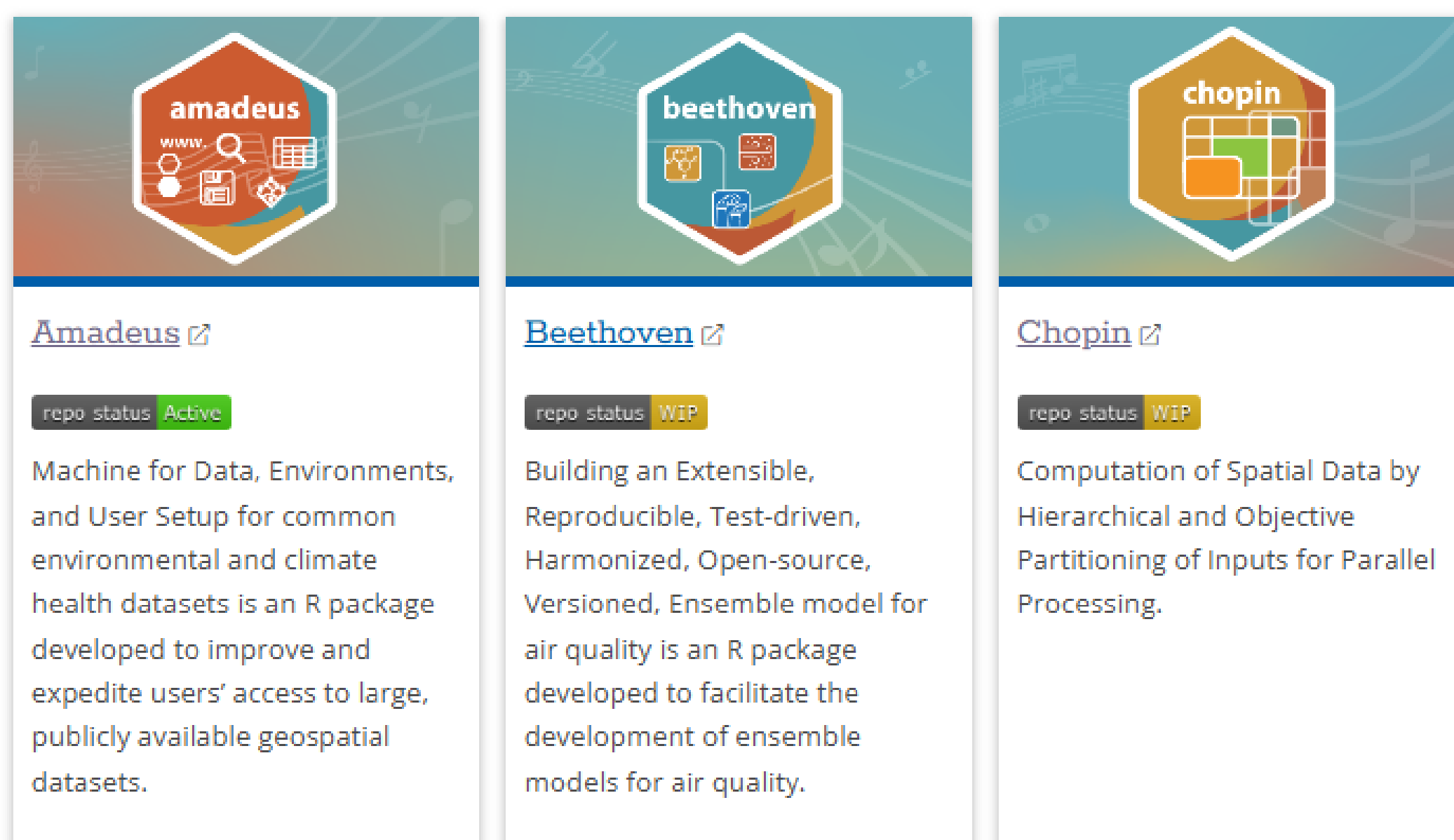
The OpenStreetMap (OSM) is a collection of worldwide community contributed or volunteered (crowd-sourced) global map information that includes roads, trails, cafés, railway stations, and much more. New, updated, and complete data are made available each week in both compressed XML and a custom PBF format.

GovExposureData | Roads | Streets | Highways | Trails | Transit Stop | Community-Contribution | Transportation | Built Environment

NLCD-TC Land Use And Land Cover, Greenness

The National Land Cover Database (NLCD) is a comprehensive land cover database for the contiguous United States (CONUS) that is managed by the Multi-Resolution Land Characteristics (MRLC) Consortium. One specific dataset within the NLCD is the Tree Canopy (TC) Cover All Years product. It provides estimates of tree canopy density across the CONUS and represents the percentage of land area that is covered by tree canopies.

Open-source Software Tools



Amadeus

repo status: Active

Machine for Data, Environments, and User Setup for common environmental and climate health datasets is an R package developed to improve and expedite users' access to large, publicly available geospatial datasets.

Beethoven

repo status: WIP

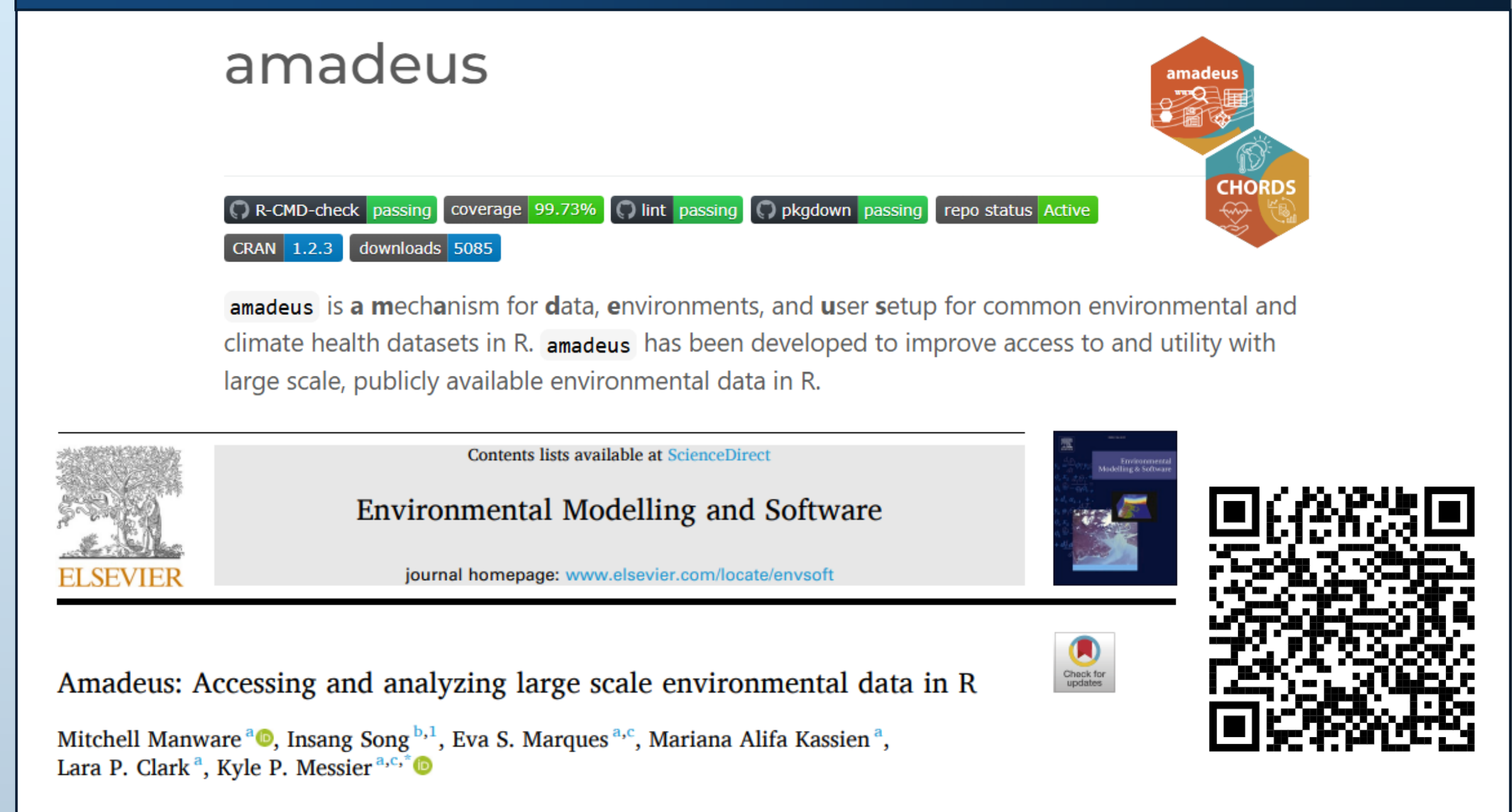
Building an Extensible, Reproducible, Test-driven, Harmonized, Open-source, Versioned, Ensemble model for air quality is an R package developed to facilitate the development of ensemble models for air quality.

Chopin

repo status: WIP

Computation of Spatial Data by Hierarchical and Objective Partitioning of Inputs for Parallel Processing.

Adameus Software



amadeus

R-CMD-check: passing coverage: 99.73% lint: passing pkgdown: passing repo status: Active

CRAN 1.2.3 downloads: 5085

amadeus is a mechanism for data, environments, and user setup for common environmental and climate health datasets in R. amadeus has been developed to improve access to and utility with large scale, publicly available environmental data in R.

Contents lists available at ScienceDirect

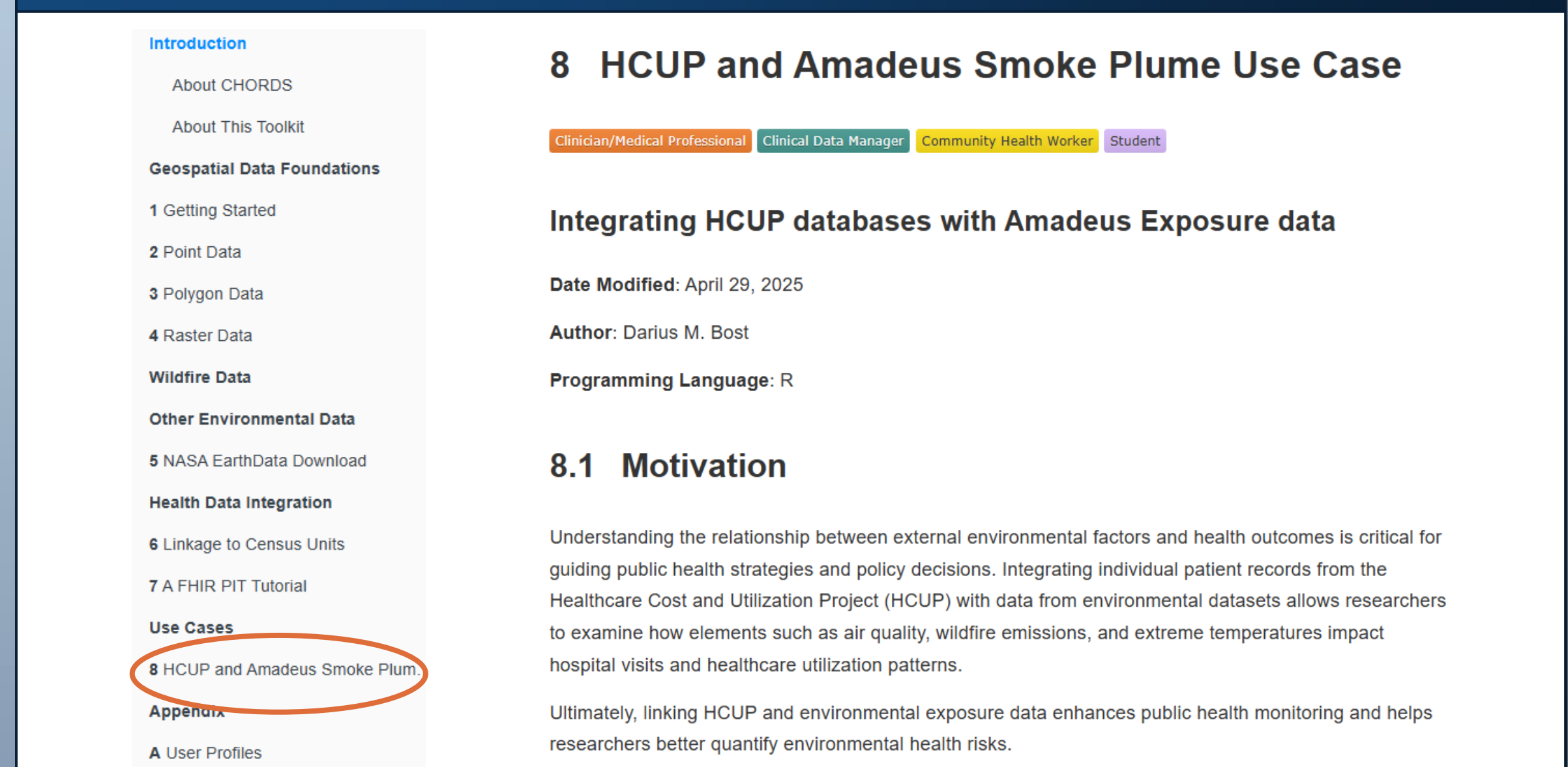
Environmental Modelling and Software

journal homepage: www.elsevier.com/locate/envsoft

Amadeus: Accessing and analyzing large scale environmental data in R

Mitchell Manware^a, Insang Song^{b,1}, Eva S. Marques^{a,c}, Mariana Alifa Kassien^a, Lara P. Clark^a, Kyle P. Messier^{a,c}

Training and Tutorials



Introduction

About CHORDS

About This Toolkit

Geospatial Data Foundations

1 Getting Started

2 Point Data

3 Polygon Data

4 Raster Data

Wildfire Data

Other Environmental Data

5 NASA EarthData Download

Health Data Integration

6 Linkage to Census Units

7 A FHIR PIT Tutorial

Use Cases

8 HCUP and Amadeus Smoke Plume

Appendix

A User Profiles

8 HCUP and Amadeus Smoke Plume Use Case

Clinician/Medical Professional Clinical Data Manager Community Health Worker Student

Integrating HCUP databases with Amadeus Exposure data

Date Modified: April 29, 2025

Author: Darius M. Bost

Programming Language: R

8.1 Motivation

Understanding the relationship between external environmental factors and health outcomes is critical for guiding public health strategies and policy decisions. Integrating individual patient records from the Healthcare Cost and Utilization Project (HCUP) with data from environmental datasets allows researchers to examine how elements such as air quality, wildfire emissions, and extreme temperatures impact hospital visits and healthcare utilization patterns.

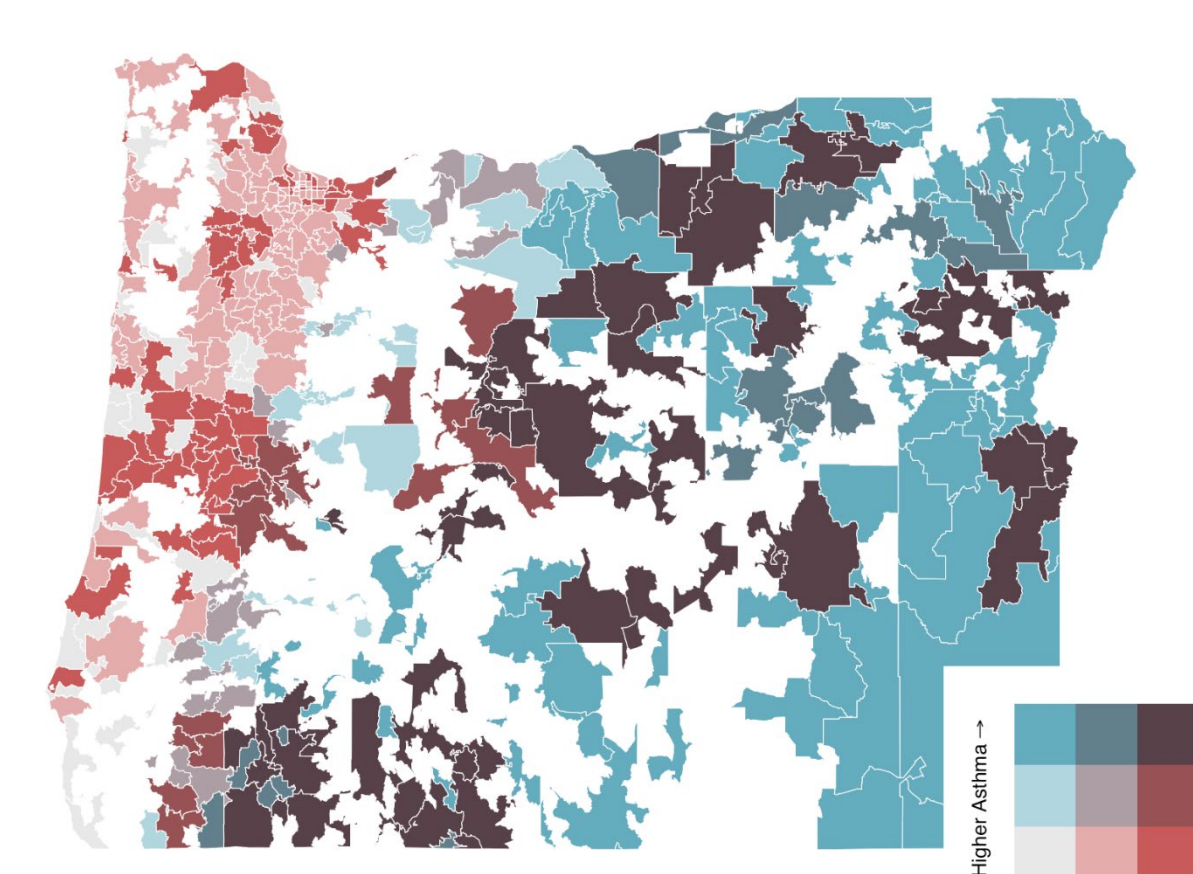
Ultimately, linking HCUP and environmental exposure data enhances public health monitoring and helps researchers better quantify environmental health risks.

Wildfire Use Case with HCUP Data (Oregon, 2021)

- Logistic regression model: exposure to medium and heavy smoke significantly increases the odds of asthma diagnosis
- Demonstrates utility of amadeus software in processing NOAA HMS wildfire smoke data
- Combining environmental and clinical data can support targeted public health interventions

Asthma Prevalence vs Heavy Smoke Exposure by ZIP Code

Bivariate map showing intersection of health and environmental burden



Legend:

X-axis (red): higher smoke exposure

Y-axis (blue): higher asthma

Color interpretations:

- Dark red: high smoke, low asthma
- Dark blue: high asthma, low smoke
- Dark purple: high smoke, high asthma
- Light gray: low smoke, low asthma

Source: HCUP-Amadeus

Conclusion

By building a data ecosystem of evolving publicly available resources, CHORDS aims to empower a diverse group of end users – including researchers, health care providers, policy and decisionmakers, and community groups – seeking to examine and mitigate the adverse health consequences of wildfires and other environmental health disasters and emergencies.



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