The OHDSI Analysis Viewer: Utilizing a suite of open-source packages and standardized tools in a unified platform for the interactive analysis of observational data

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Background

The field of observational health data sciences requires robust and standardized tools for analyzing large-scale healthcare datasets. The OHDSI community has been at the forefront of developing open-source packages and tools, largely contributed by the Health Analytics Data-to-Evidence Suite (HADES) set of packages, to facilitate observational research[1-4]. However, while the existing tools are excellent at generating results, they require individual installation and usage, multiple different outputs, and lack a unified interface. Furthermore, as research within the OHDSI community continues to progress and new tools such as PheValuator[5] are built, it is crucial that they can be integrated into the existing OHDSI analysis suite in a streamlined fashion. To address these unmet needs, we developed the OHDSI Analysis Viewer, which serves as an interactive user interface that combines multiple individual tools and underlying methods into a singular, central platform.

Methods

The OHDSI Analysis Viewer is an integrated platform that combines a suite of open-source packages and standardized tools. Many HADES packages are utilized, including (but not limited to): CohortGenerator, CohortDiagnostics, Characterization, CohortIncidence, CohortMethod, PatientLevelPrediction, SelfControlledCaseSeries, EvidenceSynthesis, and PheValuator. These tools encompass a wide range of analytical functionalities essential for observational health data research. Another OHDSI package, ResultModelManager, is used to manage the results generated by the HADES packages and store them within database schemas that the OHDSI Analysis Viewer can then access and query from to present the results in a unified fashion. The OHDSI Analysis Viewer itself is a large, complex shiny application which is a popular framework for building and sharing interactive web applications using the R programming language[6]. To bring the HADES packages and individual tools together, we make use of shiny modules, which are self-contained units of code that encapsulate specific functionalities, allowing for modularity and reusability within the larger application.

There are two packages that act as the engine that drives the OHDSI Analysis Viewer: OhdsiShinyModules and ShinyAppBuilder. The OhdsiShinyModules package is a versatile collection of modular components specifically designed for building Shiny applications within the OHDSI ecosystem. Each of the aforementioned HADES packages are modularized within this package, allowing for interoperability between each of the tools within the single platform. It also simplifies the development process by offering a set of pre-built, reusable components that can be easily integrated into new shiny modules. On the other hand, the ShinyAppBuilder package offers features such as preconfigured project directories, automated dependency management, and configurations for OHDSI-specific modules and functionalities. ShinyAppBuilder enables users to combine HADES modules together into a single shiny app, as well as control the dashboard menu, appearance, icons, and order of the modules. It also assists in managing the deployment of shiny applications and the addition of newly customized shiny modules, making it easier to share and distribute the developed apps to the broader community.

Results

For the software demo, we will showcase the configuration, integration, and functionality of these tools within the OHDSI Analysis Viewer. Given that the OHDSI Analysis Viewer itself is the endpoint of conducting a study where the user can interactively explore their data, analyses, and cohorts, the context within the application will be highly study-dependent. For the demo, a sample project will be used to demonstrate the functionality of the application itself, ranging from navigating through the app to the interactivity of clicking the buttons, filters, selectors, and other components that streamline the analysis process (**Figure 1**). The demo will *not* dive deeply into the methods or theory of the various analysis packages themselves. Additionally, the demo will illustrate how the OhdsiShinyModules and ShinyAppBuilder packages work on the backend and come together to render the application the end-user sees. Another simple example of how to create a new module in OhdsiShinyModules and how to configure its deployment using ShinyAppBuilder will be displayed and will also be deployed in real-time so that anyone attending the demo will see firsthand how the backend and frontend of the platform come together and operate (**Figure 2**).

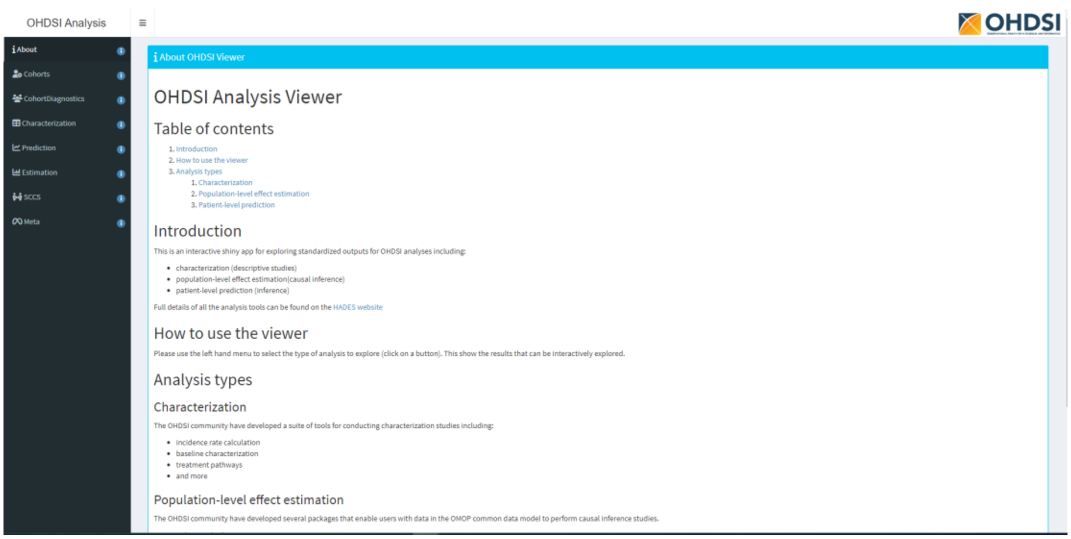

Figure 1. The OHDSI Analysis Viewer user interface (UI).

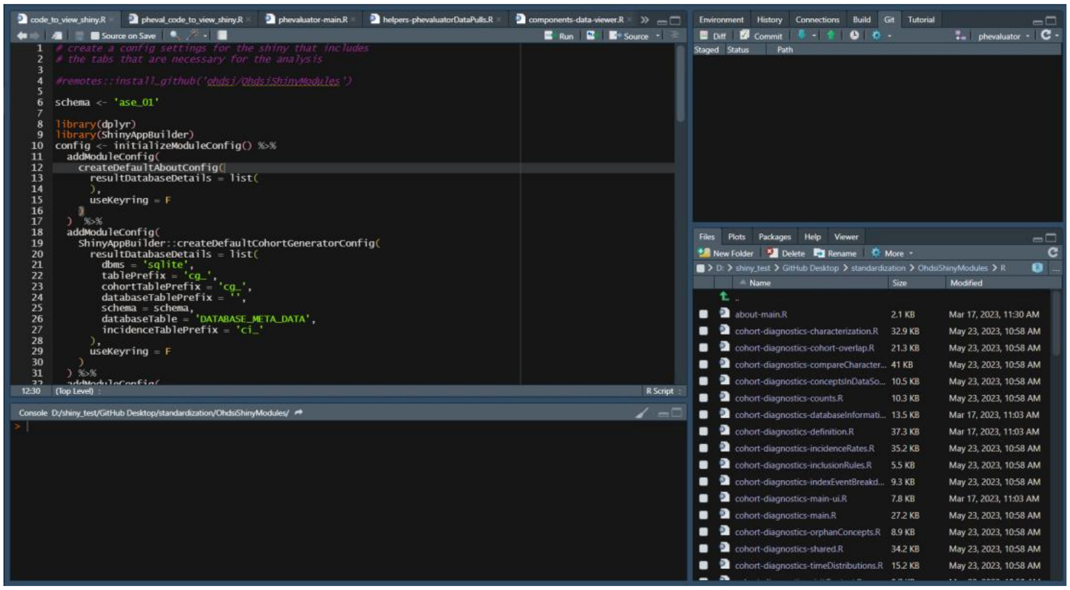

Figure 2. The backend of the OHDSI Analysis Viewer

Conclusion

The software demo of the OHDSI Analysis Viewer will offer the OHDSI community a unique opportunity to witness firsthand where we, as a community, are headed in terms of visualizing and disseminating real-world evidence generated from observational health data. The experience will highlight the power and versatility of this unified platform for interactive analysis in real-time. Attendees will be able to experience and understand the integration of multiple open-source packages and tools into a single interface, promoting efficient workflows and reproducible research. We anticipate that the software demo will highlight the practical benefits of the OHDSI Analysis Viewer, encouraging support for its development as well as its adoption as a valuable resource for conducting sophisticated observational health data analyses in the future.

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