Leveraging the United States Core Data for Interoperability (USCDI) Data Elements for Enhanced Health Risk Assessment: An Illustrative Case Study on Atherosclerotic Cardiovascular Disease (ASCVD)

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Overview

This study evaluates how well the United States Core Data for Interoperability (USCDI) supports four widely used ASCVD risk calculators, given the need for complete, standardized electronic health record (EHR) data for accurate prediction. By mapping calculator inputs to USCDI Versions 1 through Draft Version 5, it assesses progress in interoperability and highlights persistent gaps that limit clinical utility.

Background

- ASCVD is the leading cause of death in the United States[1]. Preventive care relies on risk calculators that use EHR data, such as blood pressure, lipid profiles, and smoking status.
- The USCDI, a federal standard, aims to standardize such elements across systems[2].
- While USCDI versions have expanded in scope, critical inputs like family history, detailed labs, and behavioral data remain inconsistently represented[3].
- This misalignment limits the accuracy, equity, and scalability of risk scores in clinical practice.

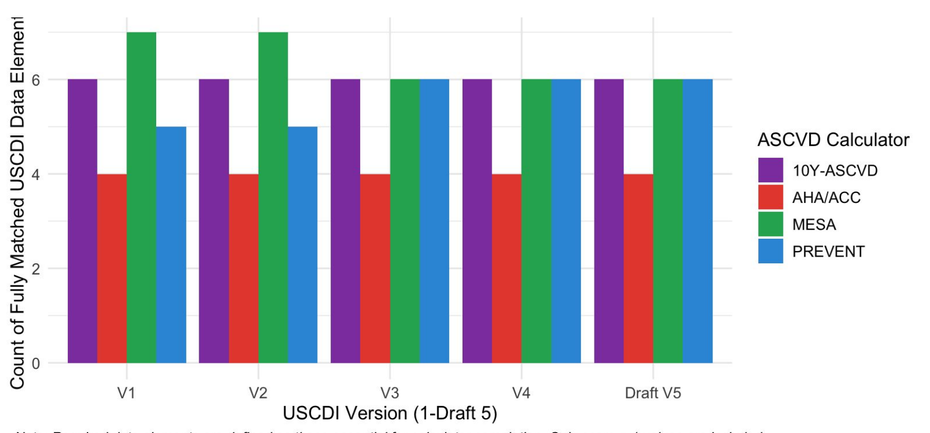
Study Design

- A systematic comparative mapping approach evaluated whether USCDI Versions 1 through Draft V5 contained the required, optional, or not included data elements for four ASCVD risk calculators:
  - **10-Year ASCVD**[4]
  - **PREVENT**[5]
  - **MESA**[6]
  - **AHA/ACC**[7]
- Each calculator input was scored as:
  - ***required*** (1); ***optional*** (0.5); ***not included*** (0)

  Data elements were manually mapped and coded using Excel.
- Visualizations were created in R[8] using:
  - **ggplot2**[9], **tidyverse**[10], and **pheatmap**[11].

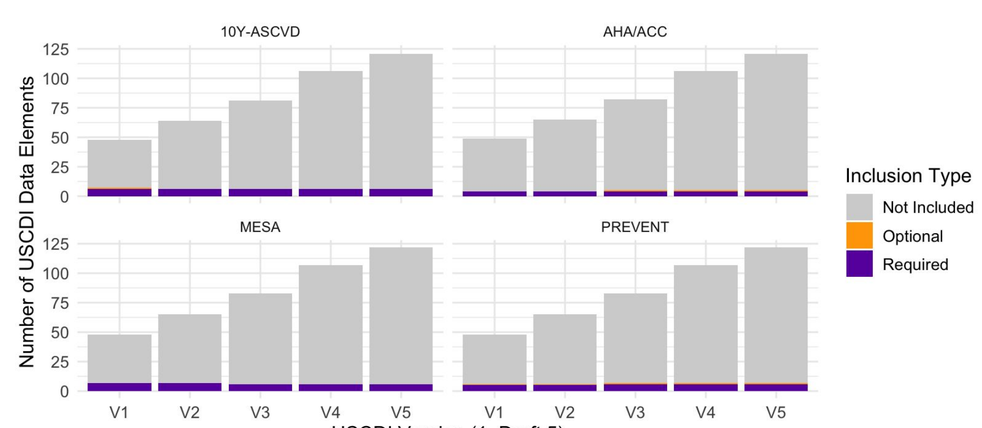
  to show alignment trends and progression in data completeness across USCDI versions.
- Feedback from New England HIEs (RIQI, VITL, HIN, Connie) informed data validation.

Results



Note: Required data elements are defined as those essential for calculator completion. Only score = 1 values are included.

Figure A. Required USCDI Data Elements by ASCVD Calculator and Version



Note: Required = 1, Optional = 0.5, Not Included = 0. Data reflect inclusion scores mapped per USCDI version.

Figure B. Distribution of USCDI Element Inclusion by Calculator and Version

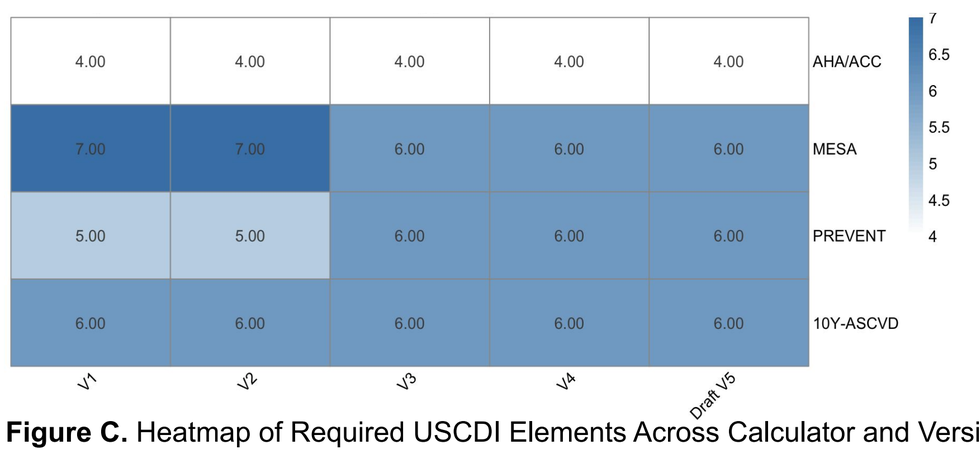


Figure C. Heatmap of Required USCDI Elements Across Calculator and Version

- **Figure A.** While **10Y-ASCVD** and **PREVENT** improved over time, **AHA/ACC** remained static with only four matched elements.
- **Figure B.** Most USCDI data elements remain unmapped, with only modest increases in required and optional fields.
- **Figure C.** Alignment of required elements plateaued by Version 3, limiting USCDI's compatibility with ASCVD calculators.

Conclusion

- USCDI versions remain misaligned with ASCVD calculators. No calculator achieved full alignment (**Figure A**); AHA/ACC plateauing at four matched inputs, while others peaked at six (**Figure C**).
- Gaps in lipid subfractions, family history, and behavioral data limit clinical integration. Aligning USCDI with validated inputs could strengthen risk stratification and EHR-based prevention.
- This mapping provides a scalable model for evaluating interoperability in other chronic disease tools.

References

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