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ELIXHAUSER COMORBIDITY SOFTWARE REFINED FOR ICD-10-CM

The Elixhauser Comorbidity Software Refined for ICD-10-CM is one in a family of databases and software tools developed as part of the [Healthcare Cost and Utilization Project \(HCUP\)](#), a Federal-State-Industry partnership sponsored by the Agency for Healthcare Research and Quality. HCUP databases, tools, and software inform decision making at the national, State, and community levels.

Contents:

- [Overview of the Elixhauser Comorbidity Software Refined for ICD-10-CM](#)
- [Overview of the Elixhauser Comorbidity Indices Refined for ICD-10-CM](#)
- [User Guide and Other Resources](#)
- [Data Elements Required for Input Dataset](#)
- [Downloading Information for Tool and Documentation](#)
- [Archive for Prior Versions \(Including the ICD-10-CM Beta Versions\)](#)
- [For More Information, Comments, or Questions about the Elixhauser Comorbidity Software Refined for ICD-10-CM](#)


[Overview of Elixhauser Comorbidity Software Refined for ICD-10-CM](#)

The Elixhauser Comorbidity Software Refined for ICD-10-CM assigns data elements that identify 38 different pre-existing conditions based on secondary diagnoses (i.e., comorbidities) listed on hospital administrative data. The identified comorbidities *co-exist* at the time of hospitalization or outpatient encounter and were originally selected because they impacted resource allocation (e.g., length of stay or charges) and affect healthcare outcomes, such as in-hospital mortality and readmissions. The Elixhauser Comorbidity Software Refined for ICD-10-CM is based on the *International Classification of Diseases, 10th Revision, Clinical Modification* (ICD-10-CM) diagnosis codes with indicators whether the diagnoses were present on admission (POA).

The Elixhauser Comorbidity Software was originally developed using ICD-9-CM diagnosis codes and diagnosis-related groups (DRGs) to identify comorbidities reported on adult inpatient discharge data.¹ The software was translated into ICD-10-CM prior to the availability of ICD-10-CM-coded data and released as a beta version. Once ICD-10-CM-coded data became available, the beta version was evaluated by clinical experts. The recommended modifications (implemented in v2021.1) transition the software tool out of its beta status and into the Elixhauser Comorbidity Software Refined for ICD-10-CM.

The Elixhauser Comorbidity Software Refined for ICD-10-CM retains the same intent of the original ICD-9-CM version of the software of defining a comprehensive list of comorbidity measures for use with large administrative databases; however refinements were made to some of the comorbidity measures. The number of comorbidity measures increases from 29 to 38 starting in v2021.1 with three measures added, five measures modified to create 12 more specific measures, and one measure discontinued. A subset of the comorbidity measures uses the POA indicators to determine whether the condition indicated by the secondary diagnosis arose prior to or during the hospital stay. The remaining comorbidity measures do not use POA indicators because the condition can be assumed to be pre-existing and not the result of hospital care (e.g., diabetes, AIDS).

The development of the Elixhauser Comorbidity Software Refined for ICD-10-CM did not explicitly focus on pediatric hospitalizations or outpatient visits. Additional and/or different comorbidity measures may apply to those populations.

¹ Elixhauser, Anne, et al. Comorbidity Measures for Use with Administrative Data. *Medical Care*, vol. 36, no. 1, 1998, pp. 8-27 JSTOR, <https://www.jstor.org/stable/3766985>.  Accessed 5 Sept. 2020.

[Return to Contents](#)

Overview of Elixhauser Comorbidity Indices Refined for ICD-10-CM

The Elixhauser Comorbidity Indices were originally developed using ICD-9-CM diagnosis codes and adult, nonmaternal inpatient discharge data.² The development of the ICD-10-CM version of the indices was consistent with the methodology used for the ICD-9-CM version of the tool but used more recent 2018 data.

The Elixhauser Comorbidity Indices Refined for ICD-10-CM is designed to predict two frequently reported health outcomes:

- Risk of in-hospital mortality
- Risk of 30-day, all-cause readmission

Each index is a separate composite score based on the 38 individual comorbidity measures. Using the indices can be preferable to the individual measures because they account for interaction between comorbidities and reduces the necessary degrees of freedom required for estimation—especially helpful when working with small sample sizes.

² Moore BJ, White S, Washington R, Coenen N, Elixhauser A. Identifying Increased Risk of Readmission and In-hospital Mortality Using Hospital Administrative Data: The AHRQ Elixhauser Comorbidity Index. Med Care. 2017 Jul;55(7):698-705.

[Return to Contents](#)

User Guide and Other Resources

The following table provides information on where to find the various resources available for the Elixhauser Comorbidity Software Refined for ICD-10-CM tool. The download section includes all of the referenced materials.

Descriptions	Elixhauser Comorbidity Resource
Development of Elixhauser Comorbidity Software Refined for ICD-10-CM	User Guide: Elixhauser Comorbidity Software Refined for ICD-10-CM, Description of the Elixhauser Comorbidity Software Refined and Appendix A
Mapping diagnosis codes with more than one comorbidity measure	User Guide: Elixhauser Comorbidity Software Refined for ICD-10-CM, Mapping of ICD-10-CM Diagnosis Codes into More Than One Comorbidity Measure and Appendix C
ICD-10-CM coding guidelines that may impact the identification of comorbidities	User Guide: Elixhauser Comorbidity Software Refined for ICD-10-CM, ICD-10-CM Coding Guidelines that May Impact the Identification of Comorbidities
Background on the Elixhauser Comorbidity Software Indices Refined for ICD-10-CM	User Guide: Elixhauser Comorbidity Software Refined for ICD-10-CM, Appendix B
Technical guidance for applying the Elixhauser Comorbidity Software Refined for ICD-10-CM to administrative data	Elixhauser Comorbidity Resource
System requirements	User Guide: Elixhauser Comorbidity Software Refined for ICD-10-CM, Using the Downloadable Elixhauser Comorbidity Measure for ICD-10-CM Files, System Requirements
Input files	User Guide: Elixhauser Comorbidity Software Refined for ICD-10-CM, Using the Downloadable Elixhauser Comorbidity Measure for ICD-10-CM Files, Downloadable Files
Running the SAS programs	User Guide: Elixhauser Comorbidity Software Refined for ICD-10-CM, Using the Downloadable Elixhauser Comorbidity Measure for ICD-10-CM Files, Downloadable Files and Running the Three SAS Programs Included With the Elixhauser Comorbidity Software Refined for ICD-10-CM
Additional resources	Elixhauser Comorbidity Resource
Searchable list of measures in the Elixhauser Comorbidity Software Refined for ICD-10-CM	Elixhauser Comorbidity Software Refined for ICD-10-CM Reference File, tab Comorbidity Measures
Searchable log of changes across versions	Elixhauser Comorbidity Software Refined for ICD-10-CM Change Log

[Return to Contents](#)

Data Elements Required for Input Dataset

Data Elements Required to Assign Elixhauser Comorbidity Measures

The input dataset **must** contain an array of ICD-10-CM diagnosis without decimals to define the comorbidity measures. To determine the 18 comorbidity measures that depend on knowing if the diagnosis was present on admission (POA), the input dataset must include POA indicators. The 20 comorbidity measures that do not depend on POA indicators will always be assigned.

Data Element Name in Program	Purpose	How to Modify the Data Element Name Used in the Program	Data Element Name in HCUP Databases
DX1-DXn where n is the dimension of the diagnosis array. The dimension of the array must be at least 2 because the comorbidity measures are specific to secondary diagnoses.	Array of ICD-10-CM diagnoses (without decimals) used to assign comorbidity measures	Specify prefix for DX array using macro statement %LET DXPREFIX=	I10_DX1-I10DXn in all HCUP databases starting in data year 2016
YEAR	Discharge year (format YYYY), which is required to check whether ICD-10-CM diagnosis code is exempt from POA reporting	Not modifiable. Hard-coded into program.	YEAR
DQTR	Discharge quarter (values 1 for Jan-Mar, 2 for April-June, 3 for July-Sept, 4 for Oct-Dec), which is required to check whether the ICD-10-CM diagnosis code is exempt from POA reporting	Not modifiable. Hard-coded into program.	DQTR
Required to assign 18 of the comorbidity measures: POA1-POAn where n is the dimension of the array of indicators that the diagnosis is present on admission. The dimension of the array must be the same length as the diagnosis array.	Array of POA indicators required to assign the comorbidity measures for which coding is sensitive to the diagnosis being present on admission	Specify prefix for POA array using macro statement %LET POAPREFIX=	DXPOA1-DXPOAn

Data Elements Required to Assign the Elixhauser Comorbidity Indices Refined for ICD-10-CM

To assign the indices, the input dataset must contain all 38 comorbidity measures. The indices are designed to use all 38 comorbidity measures which means the data must have included POA indicators when the comorbidity measures were assigned.

[Return to Contents](#)

Downloading Information for the Tool and Documentation

The ZIP folder includes the SAS format library program, a SAS mapping program, a SAS index program, and all of the user documentation. At this time, the Elixhauser Comorbidity Software Refined for ICD-10-CM tool is only available as a SAS program.

Elixhauser Comorbidity Software Refined for ICD-10-CM v2025.1: Fiscal Year 2025, Released November 2024 - valid for ICD-10-CM diagnosis codes through September 2025

- [Elixhauser Comorbidity Software Refined Tool, v2025.1](#) (ZIP file, 1.8 MB) released 11/13/24

For convenience, the user documentation for the Elixhauser Comorbidity Software Refined for ICD-10-CM v2025.1 is also provided as separate documents:

- [User Guide: Elixhauser Comorbidity Software Refined for ICD-10-CM, v2025.1](#) (PDF file, 619.9 KB)
- [Elixhauser Comorbidity Software Refined for ICD-10-CM Reference File, v2025.1](#) (Excel file, 715.4 KB)
- Elixhauser Comorbidity Software Refined for ICD-10-CM Change Log
 - [v2024.1 to v2025.1](#) (Excel file 34.8 KB)

[Return to Contents](#)

Archive for the Prior Versions (Including the ICD-10-CM Beta Versions)

Copies of previous versions of the Elixhauser Comorbidity Software Refined tool and the beta versions for ICD-10-CM are available for users who need to replace or access the old programs and documentation.

- [Archive for previous versions of the Elixhauser Comorbidity Software Refined for ICD-10-CM and beta versions for ICD-10-CM](#)

[Return to Contents](#)

For More Information, Comments, or Questions About Elixhauser Comorbidity Software Refined

Questions regarding the Elixhauser Comorbidity Software Refined may be directed to HCUP User Support through the following channels:

- Email: hcup@ahrq.gov
- Phone (toll free): 1-866-290-HCUP

[Return to Contents](#)

Internet Citation: Elixhauser Comorbidity Software Refined for ICD-10-CM Healthcare Cost and Utilization Project (HCUP). January 2025. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/toolssoftware/comorbidityicd10/comorbidity_icd10.jsp.
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Last modified 1/24/25

Back to Top 

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