Checklist for Working With the NIS

The National (Nationwide) Inpatient Sample (NIS) is part of a family of databases and software tools developed for the Healthcare Cost and Utilization Project (HCUP).

The number of studies using the NIS has increased rapidly in recent years. HCUP databases, including the NIS, are consolidated sources of information that can be used for many types of research. Researchers, peer manuscript reviewers, and journal editors need to understand the NIS database design, its strengths and limitations, and how it has changed over time to ensure its appropriate use and to interpret study results.[1,2] This Web page provides a checklist of key elements to consider and connects you to NIS informational resources, organized into four sections:

1. NIS Data Use and Acknowledgements
2. Research Design
3. Data Analysis
4. Transition from International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) to the Tenth Revision, Clinical Modification/Procedure Coding System (ICD-10-CM/PCS).

The NIS Database Documentation page is the main resource for all information regarding the NIS, including the *Introduction to the NIS* which is recommended as a starting resource for new users.

NIS Data Use and Acknowledgments

☐ Obtain and adhere to the Data Use Agreement (DUA).[a]	The DUA governs the disclosure and use of the data, including affirmations to protect individuals, establishments, and the database itself.	For more information, review the *Responsibilities of the Data Purchaser* and the *DUA*. To access the NIS, you must complete the *HCUP Data Use Agreement Training*.
☐ Verify privacy protections for individuals and hospitals.	Individuals cannot be identified directly or indirectly. Reporting cell sizes ≤10 increases the risk of re-identification and should be avoided. At least two hospitals must contribute to each cell.	For more information, review the *Requirements for Publishing with HCUP Data*.
☐ Cite HCUP, the NIS, and other HCUP tools.	HCUP, the NIS, and other supporting tools must be correctly cited in the abstract and manuscript.	For more information, review *Suggested Citations for HCUP Databases and Tools*.
☐ Acknowledge HCUP Data Partners.	HCUP Data Partners should be listed in the manuscript by name or acknowledged by a hyperlink to the list of HCUP Data Partners on the HCUP-US Web site.	For more information, review the *List of HCUP Data Partners for Reference in Publications*.

Research Design

☐ Learn how to account for the NIS sampling design.	The NIS is sampled from the HCUP State Inpatient Databases (SID). Accounting for the sampling design is critical for accurate analyses.	For detailed information, review the *HCUP Methods Report# 2014-04: Nationwide Inpatient Sample (NIS) Redesign Report*. To learn more about the NIS sample design, view the *HCUP Sample Design On-line Tutorial* on the *Tutorial Series* page.
☐ Only inpatient events are captured in the NIS.	The unit of analysis in the NIS is inpatient stays, not individual patients. Only conditions, procedures, and diagnostic tests occurring during a specific inpatient hospital encounter are captured in the NIS. Records of events and diagnoses before or after the stay are not available.	For more information, review the *Contents of the NIS* section of the *Introduction to the NIS* on the *NIS Database Documentation* page. For more information on conducting revisit analyses at the national level, review the *Nationwide Readmissions Database (NRD)*. For State-level information, review the *HCUP Supplemental Variables for Revisit Analyses*.
☐ No State-level analyses are performed.	The sampling design of the NIS does not support State-level analyses. The SID must be used for State-level research.	For more information, review *Why the NIS Should Not Be Used to Make State-Level Estimates*. To learn more about the SID, review the *Overview of the State Inpatient Databases (SID)*.
☐ No facility-level analyses are performed.	Starting in 2012, hospital identifiers are not included in the NIS. The sampling design of the NIS does not support health care facility-level analyses. You should not attempt to identify individual facilities, as specified in the Data Use Agreement.	For more information, review the *Sampling Procedure* section of the *Introduction to the NIS* on the *NIS Database Documentation* page. To learn more about hospital identifiers and the NIS, review *HCUP Methods Report# 2014-04: Nationwide Inpatient Sample (NIS) Redesign Final Report*.
☐ No physician-level analyses are performed.	The sampling design of the NIS does not support physician-level analyses.	For more information, review the *Sampling Procedure* section of the *Introduction to the NIS* on the *NIS Database Documentation* page.
☐ Administrative (ICD) codes are appropriate for the outcomes of interest.	Administrative codes for the conditions or procedures of interest (ICD-9-CM and ICD-10-CM/PCS) should be selected with care, especially over time, as codes	For more information, review the *ICD-9-CM Diagnosis and Procedure Codes* section of the *Introduction to*

	and coding rules change annually.	*the NIS* on the *NIS Database Documentation* page. For more information on the key differences between ICD-9-CM and ICD-10-CM/PCS, review the *Brief Introduction to ICD-10-CM/PCS Codes* report. To check for year-to-year variation in administrative codes, review the *ICD-9-CM Conversion Table* or consult with a medical coding professional.
☐ Administrative (ICD) codes are appropriate for the setting of care.	Procedures in the NIS reflect those performed primarily in the inpatient setting and are identifiable using ICD-9-CM or ICD-10-PCS codes. Be aware that diagnostic tests are undercoded in hospital administrative data. The State Ambulatory Surgery and Services Databases (SASD) must be used for ambulatory surgery and services research.	For more information, review the *Diagnosis and Procedure Codes* section of the *Introduction to the NIS* on the *NIS Database Documentation* page. To learn more about the SASD, review the *Overview of the State Ambulatory Surgery and Services Databases (SASD)*.
☐ Comorbidities must be distinguished from complications.	Secondary diagnosis codes in the NIS do not differentiate comorbidities from complications, unless they are specific to in-hospital events captured by a specific ICD code that indicates a complication.	For more information, review the *HCUP Methods Report# 2004-01: Comorbidity Software Documentation* and *Elixhauser Comorbidity Software* page on the HCUP-US Web site.
☐ Account for year- and State-based differences in data element availability in the NIS.	The study design should account for differences in data element availability across States and across data years. Examples are the number of diagnosis codes present and race/ethnicity reporting.	For more information about data element availability in the NIS, review the *NIS Description of Data Elements*.

Data Analysis

☐ Use weights for national estimates.	To generate national estimates using the NIS, you must apply weights using the variable DISCWT. To generate national estimates using multiple years of the NIS, you must apply weights using the variable TRENDWT (for data years prior to 2012) and the	For general information on weights, review *Trend Weights for HCUP NIS Data*. To learn how to apply NIS weights, view the *Producing National HCUP Estimates On-line Tutorial* and review *HCUP Methods Series Report# 2006-05: Using the HCUP National Inpatient Sample to*

	variable DISCWT (for data years 2012 and later).	*Estimate Trends (Revised 12/15/15)*. To learn how to apply the trend weights for multi-year analyses, view the *HCUP Multi-Year Analysis On-line Tutorial* on the *Tutorial Series* page.
☐ Account for the design of the NIS when calculating standard errors.	There are two methods for calculating standard errors for estimates produced from the NIS.	For information applicable to data years 2012 and later, review *HCUP Methods Series Report# 2015-09: Calculating National Inpatient Sample (NIS) Variances for Data Years 2012 and Later*. For information applicable to data years 2011 and earlier, review *HCUP Methods Series Report# 2003-02: Calculating National Nationwide Inpatient Sample (NIS) Variances for Data Years 2011 and Earlier*. To learn how to calculate standard errors, view the *HCUP Calculating Standard Errors On-line Tutorial* on the *Tutorial Series* page.
☐ Account for clustering or nesting of observations.	Discharges in the NIS are clustered, or nested, within hospitals. Hierarchical linear modeling (HLM) is one way to account for this design aspect of the NIS.	For information on using HLM with the NIS, review the *HCUP Methods Series Report# 2007-01: Hierarchical Modeling Using HCUP Data*.
☐ Account for missing values.	Several techniques are available to assess and reduce the impact of missing data when using the NIS.	For general information, review the *Missing Values* section of the *Introduction to the NIS* on the *NIS Database Documentation* page. For detailed information, review the *HCUP Methods Report# 2015-01: Missing Data Methods for the NIS and SID*.
☐ Calculate rates of hospital care events per population when you need to control for differences in the underlying populations.	There are several sources of population data that can be used with the HCUP databases to calculate rates of hospital care events per population to improve comparisons between subgroups (e.g., region of the country).	For detailed information, review the *HCUP Methods Report# 2016-04: Population Denominator Data for Use with HCUP Databases (Updated with 2015 Population Data)*.
☐ Estimate incidence or prevalence.	The NIS can be used to estimate incidence or prevalence of both common and rare conditions in	For information on estimating incidence and prevalence, review the *HCUP Methods Series*

	some, but not all scenarios.	*Report# 2016-06: Using the HCUP Databases to Study Incidence and Prevalence*.

ICD-9-CM to ICD-10-CM/PCS Transition

☐ Account for the effects of ICD-10-CM/PCS.	The transition to ICD-10-CM/PCS is expected to have a direct impact on the reporting of medical services, and these changes will affect research using administrative data.	For more information about the transition, review the *ICD-10-CM/PCS Resources*.
☐ Account for changes in the NIS related to ICD-10-CM/PCS.	The structure of and data elements included in the NIS are affected by the transition to ICD-10-CM/PCS.	For more information about these changes, review the *2015 NIS Revised Structure and New Data Elements* on the *NIS Database Documentation* page.
☐ Follow HCUP recommendations for reporting trends with data that include both ICD-9-CM and ICD-10-CM/PCS coding.	The 2015 NIS includes 9 months of data with ICD-9-CM codes and 3 months of data with ICD-10-CM/PCS codes. Recommendations for reporting trends based on HCUP data have been developed to help researchers design studies that include this transitional year.	For more information, review the *Recommendations for Reporting Trends Using ICD-9-CM and ICD-10-CM/PCS Data*.
☐ Use current versions of HCUP Tools.	ICD-10-CM/PCS coding guidance is continuing to evolve. As coding guidance changes, HCUP Tools, including the Clinical Classifications Software (CCS) for ICD-10-CM/PCS, will be updated and should be reapplied throughout the research process.	For more information, review the *Doing Analysis with ICD-10-CM/PCS Data* section of the ICD-10-CM/PCS Resources page. To learn how to apply HCUP Tools to your data and confirm the Tool version, view the *HCUP Tools On-line Tutorial* on the *Tutorial Series* page.

[a] HCUP data users acknowledge that violation of the AHRQ confidentiality statute is subject to a civil penalty of up to $14,140 under 42 U.S.C. 299c-3(d), and that deliberately making a false statement about this or any matter within the jurisdiction of any department or agency of the Federal Government violates 18 U.S.C. 1001 and is punishable by a fine, up to five years in prison, or both. Violators of this Agreement may also be subject to penalties under state confidentiality statutes that apply to these data for particular states.

References

1. Khera R, Krumholz HM. With great power comes great responsibility: big data research from the National Inpatient Sample. Circulation: Cardiovascular Quality and Outcomes 2017 Jul;10:e003846. http://circoutcomes.ahajournals.org/content/10/7/e003846.long
2. Khera R, Angraal S, Couch T, et al. Adherence to methodological standards in research using the National Inpatient Sample. JAMA 2017;318(20):2011–8. https://jamanetwork.com/journals/jama/article-abstract/2664461