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Overview of the HCUP Nationwide Readmissions Database (NRD)

HCUP Webinar ♦ December 9, 2015

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- Thank you for joining us for this Healthcare Cost and Utilization Project (HCUP) webinar on using the Nationwide Readmissions Database (NRD) designed to support national analysis of readmissions.
- This first webinar will introduce researchers to the design of the NRD and demonstrate readily available information on national readmission rates
- The second webinar (12/16) will demonstrate how to use the NRD to calculate national estimates of readmissions

- In this webinar you'll learn:
 - How the NRD differs from other HCUP inpatient databases
 - The design of the NRD and its limitations
 - Readily available information on national readmissions counts, rates, and costs



Before we get started, a quick word about HCUP:

- HCUP is sponsored by the Agency for Healthcare Research and Quality (AHRQ).
- HCUP is a family of databases, software tools, and related research products that enable research on a variety of healthcare topics.
- If you are unfamiliar with HCUP or would like a refresher, please consider taking our [General Overview Course](#).



HCUP
Databases

Research
Tools

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User Support

HCUP has Seven Types of Databases

- Three State-level databases



State Inpatient Databases
(SID)

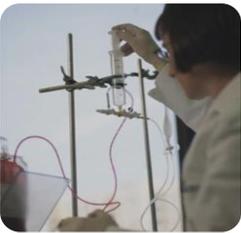


State Ambulatory Surgery & Services Databases
(SASD)



State Emergency Department Databases
(SEDD)

- Four nationwide databases



National Inpatient Sample
(NIS)



Nationwide Emergency Department Sample
(NEDS)



Kids' Inpatient Database
(KID)



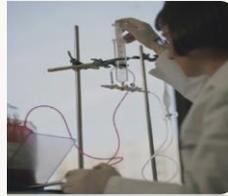
Nationwide Readmissions Database
(NRD)

State Inpatient Databases (SID)



All inpatient discharges from a census of hospitals from participating HCUP Partner States

National Inpatient Sample (NIS)



A sample of discharges (all ages) from all hospitals in the SID (starting in 2012)



Kids' Inpatient Database (KID)



A sample of pediatric discharges from all hospitals in the SID

Nationwide Readmissions Database (NRD)



All discharges from all hospitals in SID with verified patient linkage numbers



Comparison of the HCUP Inpatient Databases



	HCUP Inpatient Databases			
HCUP Database	SID (2013)	NIS (2013)	KID (2012)	NRD (2013)
States	43 States + DC	43 States + DC	44	21
Hospitals	4,400	4,400	4,200	2,000
Inpatient discharges	33 million	7 million	3 million	14 million
Derived From	--	SID	SID	SID
Uses	Examine State and local market area statistics on health care utilization, access, quality, patient safety, etc. Readmission analyses possible in some States.	Generate national and regional estimates of health care utilization, access, quality, patient safety, etc.	Generate national and regional <u>pediatric</u> estimates of health care statistics.	Generate national estimates of all-cause and condition-specific readmissions



NRD Background



Reducing hospital readmission rates is a key strategy for improving the quality of health care and lowering health care costs.

Some HCUP State Inpatient Databases (SID) include patient linkage numbers that track sequential visits for a patient within in a State and across facilities while adhering to strict privacy guidelines.

These SID were used to develop a Nationwide Readmissions Database (NRD) that would support analyses of national estimates of hospital readmissions.

Creation

- The NRD was created to support national analyses of repeat hospital use for all types of patients, regardless of the type of health insurance. Possible outcomes of interest include national readmission rates, reasons for returning to the hospital for care, and the hospital charges for discharges with and without readmissions.

Design

- The NRD is designed for analyses at the *national* level. It is not designed to support regional, State-, or hospital-specific analyses.



States in the NRD

- SID with verified patient linkage numbers on at least 90 percent of adult discharges

Hospitals in the NRD

- Community hospitals that are not rehabilitation or long-term, acute care (LTAC) facilities

Discharges in the NRD

- All SID discharges aged 1 year and older from NRD States and hospitals, with a few exceptions
- All SID discharges aged 0 from a subset of NRD States with verified patient linkage numbers on at least 90 percent of discharges aged 0, with a few exceptions



NRD Exclusions



Type of Discharge	Percentage of SID Discharges, 2013
Included in the NRD	84.7
Excluded	15.3
Hospital-level exclusions	
Noncommunity hospitals	2.5
Rehabilitation or LTAC hospitals	0.3
Discharge-level exclusions	
Discharges from patients with an age of 0 (from 12 of 21 SID)	7.6
Discharges with missing or unverified patient linkage numbers	4.1
Questionable patient linkage numbers: same patient linkage number on 20 or more discharges	0.2
Questionable patient linkage numbers: patient is hospitalized after discharged dead	0.02
Questionable patient linkage numbers: overlapping stays	0.5
Discharges from hospitals with more than 50 percent of their total discharges excluded for any of the above causes	0.1



Overview of the NRD Sample Design



- Each annual NRD was constructed using one calendar year of the SID
- **Target Universe**
 - Inpatient discharges from community hospitals (excluding rehabilitation and LTAC hospitals) in the United States
- **Sample Frame**
 - Inpatient discharges from community hospitals (excluding rehabilitation or LTAC hospitals) in SID with verified patient linkage numbers, after exclusions
- **Discharge weights**
 - Allow the NRD to be used to produce national estimates

- The target universe of inpatient discharges in the U.S. was calculated using
 - SID total discharges for HCUP States
 - Discharge counts from the American Hospital Association (AHA) Annual Survey of Hospitals for States not included in HCUP and hospitals not reported in the SID.
- The AHA Survey also was used to identify hospital characteristics such as ownership, number of beds, teaching status, and urban-rural location.



- The sampling frame for the NRD was limited to discharges for patients treated at community hospitals in the NRD States that were not rehabilitation or LTAC facilities.
- All of the discharges in the sampling frame were included making the NRD a sample of convenience.
- Developing the database using a 100 percent sample allows researchers to study both all-cause and condition-specific readmissions.



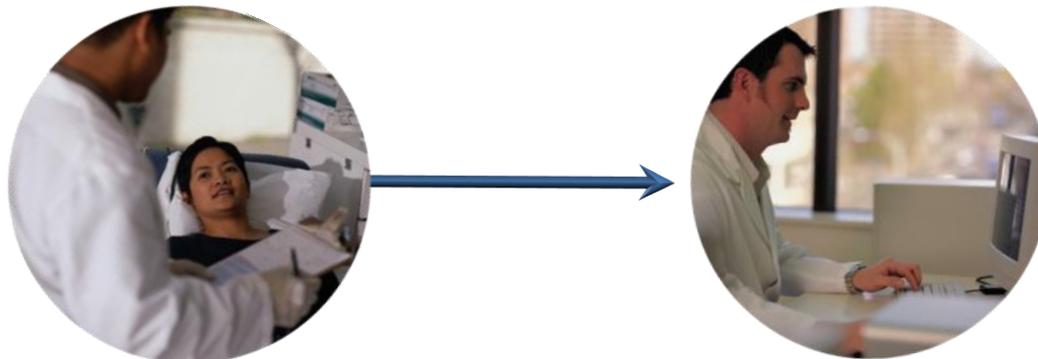
- To ensure generalizability, weights were developed after the data were stratified by the following:

Hospital Characteristics	Patient Characteristics
Census region, urban-rural location, teaching status, bed size, and hospital control	Sex and five age groups [0, 1-17, 18-44, 45-64, and 65 and older]

- Hospital-level weights are not available. The NRD is not designed to support hospital-specific analyses.

- The NRD includes about 14 million discharges per year.
- Types of discharges included in the NRD
 - Conditions that may lead to a readmission
 - Conditions that generally do not lead to a readmission, such as childbirth and hospitalizations that resulted in death
 - Transfers
 - Pairs of discharge records representing transfers (i.e., one discharge record from the sending hospital and one discharge record from the receiving hospital) were collapsed into a single record so that the hospitalization at the receiving hospital could not be counted as a readmission.

- The NRD allows researchers to study both all-cause and condition-specific readmissions.
- Data elements were chosen to facilitate readmission analyses.
- When creating the NRD, no attempt was made to determine whether multiple visits for the same patient within the calendar year were related or unrelated.
 - **That decision was left to the analyst using the NRD.**



Key Data Elements in the NRD

- Key data elements in the NRD for studying readmissions include:

NRD Data Element	Description
NRD_VisitLink	Linkage variable for all inpatient stays associated with a unique patient
NRD_DaysToEvent	Timing variable used to determine the number of days between admissions
LOS	Length of inpatient stay (nights)



NRD_VisitLink



- All discharges in the NRD include a value for NRD_VisitLink.
- The value is based on a unique combination of the synthetic patient linkage numbers provided by the HCUP Partner organization, date of birth, and sex.
- NRD_VisitLink values are not recognizable as specific patient information.

- **Admission and discharge dates are not included on the NRD**
- NRD_DaystoEvent is a count variable derived from dates.
 - ▶ NRD_DaysToEvent is the number of days from a randomly chosen "start date" for each NRD_VisitLink to the admission date for each of its discharges.
- The coding scheme for NRD_DaysToEvent was designed to adhere to strict privacy guidelines and protect patient confidentiality.
- DaysToEvent is reported as missing if the admission date was unavailable.



Determining Time Between Admissions



- Use NRD_DaystoEvent and LOS to determine the number of days between the end of one admission and the start of the next admission.
- Consider the following example:
 - ▶ A patient has a 3-day hospital admission on 1/10/2013 and another admission on 1/25/2013.
 - ▶ Based on the randomly assigned start date for the NRD_VisitLink,
 - The NRD_DaysToEvent value is “1009” for the 1/10 admission.
 - The NRD_DaysToEvent value is “1024” for the 1/25 stay.
 - ▶ The number of days between the start of each admission is 15 days ($1024 - 1009 = 15$) because NRD_DaysToEvent is based on the admission date.
 - ▶ The number of days between the admissions (from discharge date of the first admission to the start of the second admission) is 12 days ($1024 - 1009 - 3 = 12$) because the patient had a 3-day length of stay.

Index Event	Readmission
the starting point for analyzing repeat hospital visits	a subsequent inpatient admission within a specified time period; readmission may be for a specific cause or any cause.

- The NRD does not include variables that identify index events and readmissions because they need to be specific to each analysis
- The criteria to determine the relationship between multiple hospital admissions for an individual patient is left to the analyst using the NRD



Example of NRD Data Elements



Clinical	Patient Characteristics	Nonclinical
<ul style="list-style-type: none">• ICD-9-CM diagnoses• ICD-9-CM procedures• Clinical Classifications Software• Chronic Condition Indicator• Comorbidity Software• Procedure Classes• APR-DRG, severity and risk of mortality score	<ul style="list-style-type: none">• Age• Sex• Income quartile of the patient's residence• Urban/rural location of the patient's residence	<ul style="list-style-type: none">• Expected primary payer• Total hospital charge• Total hospital costs (added using the HCUP Cost-to-Charge Ratios)



Limitations of the NRD



Limitations on Studying Pediatric Readmissions:

The 2013 NRD includes patients who were younger than 1 year from only 9 of the 21 SID. The weights for pediatric discharges were often higher than adult discharges.

Limitations from Using One Year of Discharge Data:

The NRD are annual files based on discharge date. Therefore, 30- or 60-day readmissions for patients admitted in the latter part of the year may not be captured if the subsequent admission crossed into the next year.

Limitations from Using State-Specific Identifiers:

Patients who were hospitalized in one State and readmitted or transferred to a hospital in another State cannot be tracked in the NRD, because each of the SID uses different coding for their patient linkage numbers. The NRD includes nonresident patients because we want to retain discharges at border hospitals that provided care for patients in their community, even though that community happened to cross State borders.

- The NRD was designed to be flexible to various types of analyses of readmissions in the United States.
- The criteria to determine the relationship between multiple hospital admissions for an individual patient in a calendar year was left to the analyst using the NRD.
- Outcomes of interest include national readmission rates, reasons for returning to the hospital for care, and the hospital costs for discharges with and without readmissions.
- The NRD is designed for analyses at the ***national*** level. It is not designed to support regional, State-, or hospital-specific analyses.





Readily Available Information on National Readmissions on HCUPnet



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Welcome to H·CUPnet

HCUPnet is a free, on-line query system based on data from the Healthcare Cost and Utilization Project (HCUP). It provides access to health statistics and information on hospital inpatient and emergency department utilization.



Begin your query here -

Statistics on Hospital Stays

National Statistics on All Stays

Create your own statistics for national and regional estimates on hospital use for all patients from the HCUP National (Nationwide) Inpatient Sample (NIS). Overview of the National (Nationwide) Inpatient Sample (NIS) [↗](#)

National Statistics on Mental Health Hospitalizations

Interested in acute care hospital stays for mental health and substance abuse? Create your own national statistics from the NIS.

State Statistics on All Stays

Create your own statistics on stays in hospitals for participating States from the HCUP State Inpatient Databases (SID). Overview of the State Inpatient Databases (SID) [↗](#)

Hospital Readmissions

Readmission Summary Tables

Ready-to-use information on readmissions to the hospital within 30 days of discharge.

Statistics on Ambulatory Surgery Use

Statistics on Ambulatory Surgery

Create your own statistics on ambulatory surgeries for participating States from the HCUP State Ambulatory Surgery and Services Databases (SASD). Compare to statistics on inpatient surgeries for participating States from the HCUP State Inpatient Databases (SID). Overview of the State Ambulatory Surgery and Services Databases (SASD) [↗](#) Overview of the State Inpatient Databases (SID) [↗](#)

Statistics on Emergency Department Use

National Statistics on All ED Visits

Create your own statistics for national and regional estimates on emergency department visits for all patients from the HCUP Nationwide Emergency Department Sample (NEDS). Overview of the Nationwide Emergency Department Sample (NEDS) [↗](#)

State Statistics on All ED Visits

Create your own statistics on emergency department visits for participating States from the HCUP State Emergency Department Databases (SEDD) and the SID. Overview of the State Emergency Department Databases (SEDD) [↗](#) Overview of the State Inpatient Databases (SID) [↗](#)

National Statistics on Children

Create your own statistics for national estimates on use of hospitals by children (age 0-17 years) from the HCUP Kids' Inpatient Database (KID). Overview of the Kids' Inpatient Database (KID) [↗](#)

National and State Statistics on Hospital Stays by Payer - Medicare, Medicaid, Private, Uninsured

Interested in hospital stays billed to a specific payer? Create your own statistics for a payer, alone or compared to other payers from the NIS, KID, and SID.

Quick National or State Statistics

Ready-to-use tables on commonly requested information from the HCUP National (Nationwide) Inpatient Sample (NIS), the HCUP Kids' Inpatient Database (KID), or the HCUP State Inpatient Databases (SID).

Quick Statistics on Readmissions

Sortable tables that provide instant information on 30-day readmissions to the hospital.

Quick Statistics on Ambulatory Surgery

Ready-to-use tables on commonly requested information from the SASD.

Quick National or State Statistics on All ED Visits

Ready-to-use tables on commonly requested information from the NEDS, SEDD, and SID.

- First Time Visitor?**
- HCUPnet overview
 - How does HCUPnet work?
 - HCUPnet methodology?
 - HCUPnet definitions?

- What's New?**
- Maps are now available on the Community-Level Statistics path. (06/08/2015) **Just Added!**
 - 2013 data for participating States. (04/09/2015) **Just Added!**
 - 2012 nationwide and state ED data -- new database just released. (12/17/2014) **Just Added!**
 - 2012 Community-level Statistics added. (11/07/2014)
 - 2012 national data on AHRQ Quality Indicators. (10/24/2014)
 - All NIS results prior to 2012 recalculated to permit trend analysis **Important Notice!**
 - New 2009-2012 readmission data added. (09/24/2014)

Projected estimates [↗](#) on specific conditions are periodically available here.

More information on HCUP data, tools, and reports [↗](#)

What is HCUP?
Brief description - what is HCUP?
Want to purchase data to do your own analysis?

The statistics in HCUPnet would not be possible without partner organizations [↗](#) that provide data to HCUP.

HCUPnet is based on aggregate statistics tables to speed up data transfer and protect individual records, so not all possible queries can be addressed. If a query is not possible, HCUPnet will not allow you to choose certain parameters. If there is a query you'd like to see that HCUPnet does not support, please write us at hcup@ahrq.hhs.gov. Internet Citation: HCUPnet, Healthcare Cost and Utilization Project, Agency for Healthcare Research and Quality, Rockville, MD. <http://hcupnet.ahrq.gov/>

<http://hcupnet.ahrq.gov>

- Free, interactive online query system
- Users generate tables of outcomes by diagnoses and procedures
- Data can be cross-classified by patient and hospital characteristics

<http://hcupnet.ahrq.gov>

HCUPnet **CAN** Produce:

- Simple statistics
- Estimates of sample size
- Trends information
- Rank ordering of diagnoses and procedures
- Significance testing

HCUPnet **CANNOT** Produce:

- More complicated queries
- Multivariate analyses
- Statistics involving certain variables

HCUPnet: Types of Readmission Rates

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HCUPnet Home	Select year	Select diagnoses or procedures	Verify codes	Results
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Do you want information on:

- ▶ [All hospital stays?](#)
Information on all stays for a specific year, not by diagnoses or procedures (select state and year on the next page).
- ▶ [Diagnoses grouped by Clinical Classifications Software \(CCS\)?](#)
You can search for specific conditions and groups of conditions under this option.
- ▶ [Diagnosis Related Groups \(DRG\)?](#)
You can search for specific DRGs under this option.
- ▶ [Major Diagnostic Categories \(MDC\)?](#)
You can search for specific MDCs under this option.
- ▶ [Procedures grouped by Clinical Classifications Software \(CCS\)?](#)
You can search for specific procedures and groups of procedures under this option.

Definitions

Clinical Classifications Software (CCS) categorizes patient diagnoses and procedures into a manageable number of clinically meaningful categories. [>more>](#)

Diagnosis Related Groups (DRGs) comprise a patient classification system that categorizes patients into groups that are clinically coherent and homogeneous with respect to resource use. [>more>](#)

Major Diagnosis Categories (MDCs) are broad groups of DRGs (Diagnosis Related Groups) that relate to an organ or a system (digestive system, for example) and not to an etiology. [>more>](#)



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HCUPnet: National Readmissions, Overall



All patient readmissions within 30 days
National statistics, 2013

Index stay - Overall

		Index Stays		Readmitted within 30 days for any cause		
		Number of stays	Mean cost \$ per stay	Number of stays	Percent readmitted	Mean cost \$ per stay
Overall		28,124,869	11,647	3,900,556	13.9	13,433
Age group	1-17	1,286,738	10,566	136,943	10.6	15,538
	18-44	7,992,650	7,948	766,180	9.6	10,795
	45-64	7,850,299	13,449	1,223,582	15.6	14,143
	65+	10,995,181	13,164	1,773,852	16.1	13,926
Sex	Male	11,556,474	13,414	1,861,039	16.1	14,147
	Female	16,568,391	10,413	2,039,515	12.3	12,783
Payer	Medicare	12,913,752	13,050	2,229,329	17.3	13,787
	Medicaid	5,342,930	9,675	737,031	13.8	12,404
	Private insurance	7,313,854	11,049	652,450	8.9	14,351
	Uninsured	1,545,807	9,192	172,754	11.2	10,179
Median income for zipcode	First quartile (lowest)	8,126,369	10,661	1,232,219	15.2	12,111
	Second quartile	7,504,123	11,430	1,037,815	13.8	13,106
	Third quartile	6,623,567	11,909	876,857	13.2	13,923
	Fourth quartile (highest)	5,446,317	13,029	694,016	12.7	15,673
Patient residence	Metropolitan	22,822,921	11,600	3,200,864	14.0	13,552
	Non-Metropolitan	5,301,948	11,847	699,692	13.2	12,901



HCUPnet: Reasons for Readmissions



Reasons for readmissions within 30 days
National statistics, 2013

Index stay - Overall

	Readmitted within 30 days for any cause		
	CCS principal diagnosis category	Number of stays	Percent readmitted
Most frequent principal diagnosis	2 Septicemia (except in labor)	241,904	6.2
	108 Congestive heart failure, nonhypertensive	195,627	5.0
	238 Complications of surgical procedures or medical care	176,809	4.5
	237 Complication of device, implant or graft	133,518	3.4
	122 Pneumonia (except that caused by tuberculosis and sexually transmitted diseases)	123,559	3.2



HCUPnet: National Readmissions, Pneumonia



All patient readmissions within 30 days
National statistics, 2013

Index stay - 122 Pneumonia (except that caused by tuberculosis and sexually transmitted diseases)

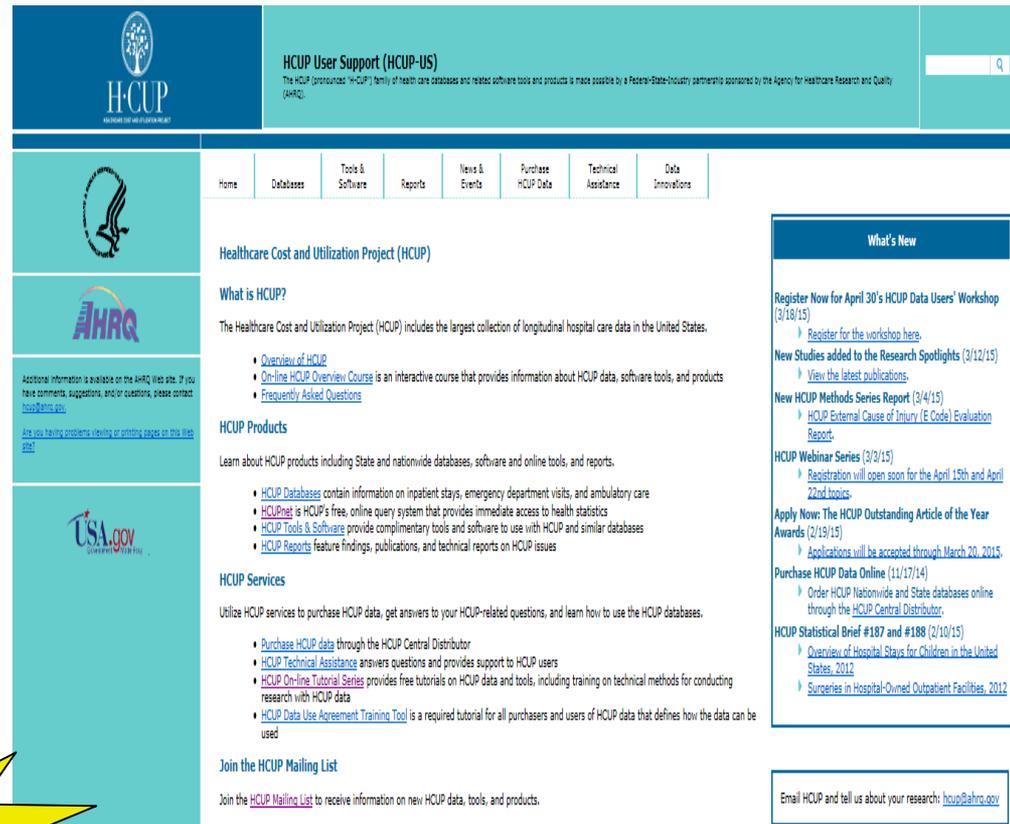
Index stay defined by the principal diagnosis, using Clinical Classification Software (CCS)

		Index Stays		Readmitted within 30 days								
				Readmissions with the same CCS as a principal diagnosis			Readmissions with the same CCS in any diagnosis			Readmissions for any cause		
				Number of stays	Mean cost \$ per stay	Number of stays	Percent readmitted	Mean cost \$ per stay	Number of stays	Percent readmitted	Mean cost \$ per stay	Number of stays
Overall		824,700	10,033	21,983	2.7	13,630	53,641	6.5	16,878	127,601	15.5	14,181
Age group	1-17	66,094	7,170	1,129	1.7	15,382	1,588	2.4	18,566	3,520	5.3	16,739
	18-44	72,068	9,490	1,930	2.7	12,621	4,023	5.6	17,117	9,292	12.9	15,094
	45-64	197,719	10,464	5,467	2.8	14,159	13,612	6.9	18,416	32,244	16.3	15,204
	65+	488,819	10,319	13,457	2.8	13,414	34,417	7.0	16,162	82,545	16.9	13,569
Sex	Male	392,161	10,115	11,090	2.8	13,775	27,074	6.9	17,655	62,611	16.0	14,727
	Female	432,539	9,959	10,893	2.5	13,482	26,567	6.1	16,086	64,989	15.0	13,655
Payer	Medicare	543,320	10,426	15,557	2.9	13,716	39,222	7.2	16,387	95,178	17.5	13,765
	Medicaid	113,324	9,715	2,971	2.6	14,242	6,538	5.8	18,930	15,519	13.7	15,496
	Private insurance	115,972	9,077	2,352	2.0	13,847	5,336	4.6	18,852	11,685	10.1	16,163
	Uninsured	32,783	7,995	647	2.0	8,721	1,447	4.4	14,276	2,926	8.9	12,880
Median income for zipcode	First quartile (lowest)	259,791	9,427	7,306	2.8	12,321	17,417	6.7	15,575	41,365	15.9	13,151
	Second quartile	233,950	9,935	6,343	2.7	13,623	15,355	6.6	16,616	35,932	15.4	13,863
	Third quartile	184,397	10,141	4,637	2.5	14,735	11,587	6.3	17,527	27,877	15.1	14,746
	Fourth quartile (highest)	133,107	11,015	3,328	2.5	15,191	8,367	6.3	19,287	20,340	15.3	16,015
Patient residence	Metropolitan	608,302	9,999	15,717	2.6	14,102	39,439	6.5	17,516	95,777	15.7	14,546
	Non-Metropolitan	216,398	10,127	6,266	2.9	12,460	14,201	6.6	15,131	31,824	14.7	13,096

- Easy access to information on

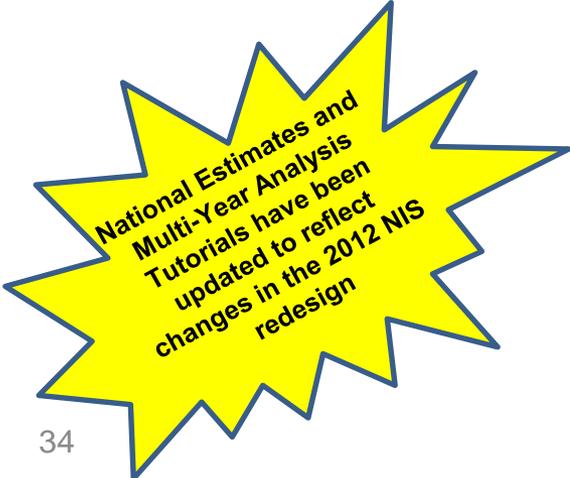
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visits annually**



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Technical Assistance
HCUP User Support answers questions and provides technical assistance to HCUP users. This service is maintained by AHRQ through a Federal-State-Industry partnership.

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HCUP FAQs

The [HCUP FAQs](#) provide answers to commonly asked questions about HCUP databases, software tools, supplemental files, and other products.

HCUP Databases

The [HCUP Databases](#) page provides detailed database overviews, information on obtaining the databases, and additional resources and documentation to assist you in using the databases. Visit the [HCUP Central Distributor](#) page for additional information on obtaining HCUP databases.

HCUP Publishing Requirements

For information on publishing with HCUP data, please review the [HCUP publishing requirements](#).

HCUP Index

To search for an HCUP topic, please review the [Index](#).

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HCUP Overview Course

To learn more about HCUP, take the *interactive, modular* [HCUP Overview Course](#) (approximately 90 minutes) that provides information about HCUP data, software tools, and products. The course covers the features, capabilities, and potential uses of HCUP resources.

HCUP Data Use Agreement Training Tool

All purchasers and users of HCUP data must complete the [HCUP Data Use Agreement \(DUA\) Training Course](#) (approximately 15 minutes) and sign an HCUP DUA before using the data. The DUA is a legally binding agreement with AHRQ that defines how you can use HCUP data.

HCUP On-line Tutorial Series

To learn more about concepts essential to conducting effective research with HCUP, refer to the *interactive, modular* [HCUP On-line Tutorial Series](#). The courses are designed to answer technical questions you may have related to HCUP data and products.

Contact Information

For Technical Support

If you have questions about HCUP databases, software tools, supplemental files, or other products, please contact HCUP User Support:

- E-mail: hcup@ahrq.gov
- Phone: 866-290-HCUP (4287) (toll free)
- International users, please contact HCUP User Support by e-mail

Staff reviews messages daily and responds to inquiries within 3 business days.

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If you have questions concerning the purchase of HCUP databases or your current order, please contact the HCUP Central Distributor:

- E-mail: HCUPDistributor@ahrq.gov
- Phone: 866-556-HCUP (4287) (toll free)
- FAX: 866-792-5313

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