How-To Guide: Sub-County Asthma Emergency Department (ED) Visits

Provided by CDC's Environmental Public Health Tracking Program

August 2021

PURPOSE AND USE OF THIS DOCUMENT

This document describes the steps to prepare emergency department data for asthma visits for dissemination by CDC'S Environmental Public Health Tracking Program.

HOW-TO GUIDE

	Description
Measures	Number of Emergency Department Visits for Asthma Crude Rate of Emergency Department Visits for Asthma Age-adjusted Rate of Emergency Department Visits for Asthma
Data Source(s)	Outpatient, inpatient, and observation stay data files
NCDM Data Requirements	• Health outcome: Asthma • Census tract/County/State of residence • Geocoding precision for each record • Age group • ED visit year Exclude: • Out-of-state residents • Admissions to federal facilities
Definitions Relevant to Indictor	*Asthma:* A common chronic inflammatory disease of airways of the lungs that causes repeated episodes of wheezing, breathlessness, chest tightness, and nighttime or early morning coughing; ICD-9-CM 493 or ICD-10-CM J45 as the primary diagnosis. *Duplicate Record*: More than one record for the same person with the same ED visit data (e.g., sex, date of birth, admission/ED visit date, and zip code have exact same information). Duplicate records may also be due to continuation of data beyond a single line. In this case, duplicates may be identified using a record sequence number. *ED Visit Date*: The calendar date of the ED visit: • Day (optional) • Month (required) • Year (required)

	Description
	ED Visit Year: An ED visit for the health outcome of interest during a specific calendar year. ED visit year is based only upon the calendar year of the visit, even when discharge or release year is different.
	Emergency Department Visit: Treatment in a hospital emergency department. This should include both patients who are treated and released and those that are admitted as inpatients from the emergency department.
	Hospital Transfers: The practice of discharging a patient from one facility and readmitting them to a second facility within 48 hours.
	ICD-9-CM code: International Classification of Diseases, 9th Revision, Clinical Modification
	ICD-10-CM code: International Classification of Diseases, 10th Revision, Clinical Modification
	Multiple Visits: More than one ED visit for the same person for the same diagnosis code occurring on different dates and related to a separate event within a given year. Multiple ED visits are considered separate events if they occurred more than 48 hours apart.
	Observation Stay: This is an alternative to inpatient admission that exists in some facilities but for the Tracking Program is considered in ED visit statistics. Observation stays may originate as an ED visit or directly as an observation stay. Note that the definition of an observation stay may not be standard across hospitals, and observation stays may not be recorded across states in a consistent manner.
	Primary Diagnosis Code: The first diagnosis field(s) of the coded clinical record (i.e., primary or principal diagnosis).
	ICD-9-CM: Prior to October 1, 2015, diagnosis codes are represented by ICD-9-CM codes (the International Classification of Diseases, 9th Revision, Clinical Modification).
	ICD-10-CM: As of October 1, 2015, diagnosis codes are represented by ICD-10-CM codes (the International Classification of Diseases, 10th Revision, Clinical Modification).
	Resident: Any person with a residential address in your city/county/state at the time of the ED visit.
	Sub-county: Sub-county (geographic resolution below county) is how the Tracking Program describes data at a finer resolution than county data. This includes census tract data and data using the Tracking Programs set of minimum population geographies, created by aggregating census tracts.
HTG Requirements and Cautions	• This How-to Guide provides instructions for the development of the Sub-county dataset for submission to CDC. The Sub-County Emergency Department Visits Data Dictionary should be referred to for the standardized definitions and notations of the variables to be submitted to CDC. The data file should be converted to the .XML file format and the required header inserted into the .XML file, according to the schema found on SharePoint.

Description
• An additional How-to Guide (entitled "How-to Guide for Measure Calculation") is available that provides instructions for calculating sub-county measures. Recipients should use the additional How-to Guide to ensure calculation of measures is consistent with those used by CDC. • *Data Source:* ED visits include both patients who are admitted to the hospital through the emergency department (inpatients) and those who are treated and released (outpatients); therefore, both inpatient and outpatient data are required for this indicator. If identified or stored separately, observation stay data should be included as well. Please consult your data steward and data mangers to understand the variables and coding system, specifically for race and ethnicity variables. • *Duplicate Records:* This How-to Guide presumes that the user has removed duplicate records (see definitions for more information), while keeping multiple visits. A case should be counted once per ED visit; deduplication of records to achieve this goal should be conducted at the discretion of the data owners, managers, or analysts. • *Complete Dataset Guidelines:* The Tracking Network's (NCDM) are based upon date of admission or ED visit because of the goal of relating an ED visit with an environmental event. Most inpatient and outpatient data are released in annual discharge-based datasets; sometimes quarterly files are also released. Because the NCDM is based on admission or ED visit date, it is necessary to have the dataset of the year of interest as well as that for the subsequent year (or first quarter of the subsequent year) in order to capture admissions/visits that were discharged in the subsequent year. For example, 2005 data should not be submitted prior to receipt of either the first quarter 2006 or annual 2006 discharge dataset from the data steward. Some discretion on this rule is allowed if a program can show that inclusion of the subsequent year's data does not impact the data for the year of interest to a degree that would require re-submission. Re-submission due to incomplete data should be avoided. • *Out-of-State ED Visits*: ED visits of residents to out-of-state hospitals should be included when available but are not required to be included. For states with significant out-of-state ED visits, it is preferable to wait until the out-of-state data are available for inclusion to avoid the need for re-submission of more complete data in the future. However, some consideration of timeliness is also appropriate; if out-of-state data are overly delayed then submission without them is acceptable. It is noted that some states must include out-of-state ED visits of its residents. Use the "OutOfStateExclusion" variable in the dataset to capture whether out of state ED visits are included or not (the Data Dictionary and schema provide for formal notation in the dataset on whether these admissions are included). Be certain to use footnotes and metadata to acknowledge the disposition of these ED visits. • *Federal Facilities:* Admissions to federal facilities, such as Veteran's Hospitals, are not included. Be certain to inform CDC if your state requires that your dataset includes admissions to federal facilities so that the measures can be appropriately footnoted. • *Transfers:* Patients transferred from or to other acute care facilities are not excluded. Use the "TransferExclusion" and "ExclusionMethod" variables in the

	Description
	dataset to capture if and how transfers were excluded (the Data Dictionary and schema provide for formal notation in the dataset on whether these admissions are included).
Step #1	Identify the data sources for ED visits. ED visits include both patients who are treated and released in the ED (outpatients) and who are admitted as inpatients through the emergency department; therefore, both inpatient and outpatient data files are required for this indicator. If identified separately, observation stay data files are also required. Note: Steps #2 – #9 could be performed in a different order so long as you retain all necessary variables needed until step #10.
Step #2a	From ED data, select all records that meet the following criteria: - Occurred during the year(s) of interest - State of residence is your state Date of admission is not missing
Step #2b	Identify ED visits in inpatient hospitalization data. From inpatient hospitalization data, select all records that meet the following criteria: - Restrict the dataset to patients who were admitted from an ED using the following criteria: - Point of origin code indicates emergency department - CPT codes: 99281-99285 - Revenue codes; 0450-0459 - Positive ED charges Note: Please refer to **Appendix A** for additional information on accurately capturing the subset of inpatient hospitalizations that were admitted through the emergency department (ED). These criteria are consistent with the criteria used by AHRQ (see: http://www.hcup-us.ahrq.gov/db/vars/siddistnote.jsp?var=hcup_ed). Then, select all records that meet the following criteria: - Occurred during the year(s) of interest State of residence is your state
Step #2c	Identify ED visits observation stay data. In states where observation stays are identified separately, include observation stay records with ED visits. Not all states require the reporting of observation stay records. Contact data stewards to determine whether records for observation stays are collected. If so, determine if the records are located with outpatient or inpatient records, or in a separate file.

	Description

	• Restrict the dataset to patients who visited the ED using the following criteria:
	   ○ Revenue code: 0762, or
	   ○ Positive OS charge when revenue codes not available, or
	   ○ CPT codes: 99217–99220 or 99234–99236
	
	Note: These criteria are consistent with the criteria used by AHRQ (see: http://www.hcup-us.ahrq.gov/db/vars/siddistnote.jsp?var=hcup_ed).
	
	Then, select all records that meet the following criteria:
	• Occurred during the year(s) of interest
	
	State of residence is your state

Step #3a
(ICD-10-CM)
	From each dataset, identify and retain ED visits with asthma (ICD-10-CM = J45,*) listed as the first-listed/primary/principal diagnosis.
	
	    ICA-10-CM Code Description
	    J45.* : Asthma
	    •J45.2* Mild intermittent asthma
	      •J45.20 Mild intermittent asthma, uncomplicated
	      •J45.21 Mild intermit. Asthma, acute exacerbation
	      •J45.22 Mild intermit. asthma, status asthmaticus
	    •J45.3* Mild persistent asthma
	      •J45.30 Mild persistent asthma, uncomplicated
	      •J45.31 Mild persistent asthma, (acute) exacerbation
	      •J45.32 Mild persistent asthma, status asthmaticus
	    •J45.4* Moderate persistent asthma
	      •J45.40 Moderate persistent asthma, uncomplicated
	      •J45.41 Mod. persistent asthma, (acute) exacerbation
	      •J45.42 Mod. persistent asthma, status asthmaticus
	    •J45.5* Severe persistent asthma
	      •J45.50 Severe persistent asthma, uncomplicated
	      •J45.51 Severe persistent asthma, (acute) exacerbation
	      •J45.52 Severe persistent asthma, status asthmaticus
	    •J45.9* Other and unspecified asthma
	      •J45.90 Unspecified asthma
	        •J45.901 Unspecified asthma, (acute) exacerbation
	        •J45.902 Unspecified asthma, status asthmaticus
	        •J45.909 Unspecified asthma, uncomplicated
	    •J45.99* Other asthma
	      •J45.990 Exercise-induced bronchospasm
	      •J45.991 Cough variant asthma
	      •J45.998 Other asthma
	   Note: '' includes all sub variation codes*

	Description

Step #3b (ICD-9-CM)	Flag admissions where primary diagnosis code is "493.*" (ICD-9-CM) by creating a variable (*for example Ishospital*) that takes the value of 1, if admission is due to diagnosis codes targeted; else its value is 2.
	
	ICD-9-CM Description
	
	493.* Asthma
	•493.0* Extrinsic asthma
	  •493.00 Extrinsic asthma, unspecified
	  •493.01 Extrinsic asthma, status asthmaticus
	  •493.02 Extrinsic asthma, (acute) exacerbation
	•493.1* Intrinsic asthma
	  •493.10 Intrinsic asthma, unspecified
	  •493.11 Intrinsic asthma, status asthmaticus
	  •493.12 Intrinsic asthma, (acute) exacerbation
	•493.2* Obstructive asthma
	  •493.20 Obstructive asthma, unspecified
	  •493.21 Obstructive asthma, status asthmaticus
	  •493.22 Obstructive asthma, (acute) exacerbation
	•493.8* Other forms of asthma
	  •493.81 Exercise-induced bronchospasm
	  •493.82 Cough variant asthma
	•493.9* Asthma, unspecified
	  •493.90 Asthma, unspecified type, unspecified
	  •493.91 Asthma, unspecified, status asthmaticus
	  •493.92 Asthma, unspecified, (acute) exacerbation
	Note: '' includes all sub variation codes*
	
	Retain only admissions identified as targeted diagnosis codes.

Step #4 (Previously geocoded data)	If data were previously geocoded, skip to step #6. Otherwise, geocode addresses for remaining records according to the Environmental Public Health Tracking Geocoding Standards document.
Step #5	If a geocoding precision variable is not already present, create new variable called "GeoCodingPrecision." Assign values to GeoCodingPrecision according to the Environmental Public Health Tracking Geocoding Standards document. There are five possible values for GeoCodingPrecision: HPCT, LPCT, UPCT, C, or S (see the Sub-County Emergency Department Visits Data Dictionary). GeoCodingPrecision must have one of these values. If you receive previously geocoded data and have not arranged for geocoding precision information ahead of time, your records will likely be set to "UPCT."

	Description
Step #6	From each dataset, remove duplicates. The following variables may be used to identify duplicate records: hospital code, medical record number, admission date, discharge date, date of birth, sex, and zip code. Duplicate records may also be due to continuation of data beyond a single record line. In this case, duplicates may be identified using a record sequence number.
Step #7	For each dataset retain, at least, the following variables. Additional variables may be necessary depending on your state's data. The actual names of the variables may differ. Please consult your data steward and data managers to understand the variables and coding system. • State of residence • County of residence • Census tract of residence • Date of admission/visit • Date of discharge • Date of birth or age at time of admission Geocoding precision code
Step #8	Merge all datasets from steps #2a, #2b, and #2c where ED visits have been identified after completing steps #3 – #7 for each.
Step #9	Create "AgeGroup" variable. Create AgeGroup variable using either patient's date of birth and date of admission or age at time of admission. The base format for AgeGroup is 5-year age groups beginning with 0-4 years and ending with 85+ years, resulting in 18 age groups plus one for unknown. Hospitalization counts must be submitted to CDC by these 5-year age groups coded from 1 to 19 (see the Sub-County Emergency Department Visits Data Dictionary).
Step #10	Create the summary variable "EDEvents" and summarize data by the following variables coded according to the Sub-County Emergency Department Visits Data Dictionary: • AgeGroup • CensusTract (patient's census tract as 11-digit FIPS code showing state, county, and tract FIPS, e.g., ssccctttttt (06067001101)) • County (patient's county of residence as 5-digit FIPS code) • EdVisitYear • GeoCodingPrecision Do not expand dataset to include all combinations of these variables where EDEvents equals zero. CDC will expand data and fill in zeros after data are validated. If missing combinations of these variables should not be interpreted as zero (for example, county X didn't report data in year Y), then please include this information in your metadata.

	Description
Step #11	Create new variable called "RowIdentifier".
	RowIdentifier should be a sequence of numbers from 1 to the number of rows in your dataset. Note: this will be included in the .XML file, but it is not included in the Sub-County Emergency Department Visits Data Dictionary.
Step #12	Create the following variable and code according to the Sub-County Emergency Department Visits Data Dictionary:
	HealthOutcomeID
	1 = Asthma
Step #13	Order the variables according to the schema: • RowIdentifier • AgeGroup • CensusTract • County • EdVisitYear • GeoCodingPrecision • HealthOutcomeID • EDEvents
Step #14	Note: CDC has created tools for XML conversion and header creation. These tools can be found at (*https://cdcpartners.sharepoint.com/sites/NCEH/EHHE/tracking/Resources/Pages/ Metadata-and-Data-Submission.aspx*).
	Create separate data files for each year of data.
	Convert dataset to .XML file.
	The data file should be converted to the .XML file format and the required header inserted into the .XML file, according to the schema found on SharePoint. Insert your state FIPS code in the XML header and make sure the Metadata Control Number is in the .XML file.
	This completes the required steps for data submission.
Step #15	Please check the following if you submit your .XML file to the gateway and it provides error messages (e.g., incorrect census tract IDs). • Census tracts should be geocoded to 2010 Census boundaries for 2019 and prior to ensure you are submitting valid 2010 census tracts. • Census tracts should have the correct county ID for the county they are in (i.e., the 11-digit FIPS code should have the tract match to the given county and state).

Description
- For example, 06067001101 shows the state (06 CA), the county (067 Sacramento County), and the tract 001101 (11.01 tract). If the county is incorrectly assigned, this will be rejected.   - There should not be duplicates of a census tract for a given stratification (e.g., census tract 06067001101 should only have one record for a given year, month, age group, sex, and geocoding precision).   - For example, you could have the following, which would be valid: 06067001101, M, high   06067001101, M, low   06067001101, F, high   06067001101, F, low   For data geocoded to the tract level, you should only have either a mix of high and low precision *or* unknown precision. This should apply across all stratifications in a given year but could change from year to year. You should not have a mix of high, low, and unknown precision for census tracts within a given year.

This is the end of the necessary steps for creating NCDMs to submit to CDC. Please see the How-to Guide for Measure Calculation for guidance on calculating measures for your state's portal.

APPENDIX A

BACKGROUND

Per the requirements provided by the CDC in this Emergency Department (ED) How-to Guide, it states: *"ED Visits include both patients who are admitted to the hospital through the emergency department (inpatients) and those who are treated and released (outpatients); therefore, <u>both</u> inpatient and outpatient data are required for this indicator."*

Given this information, ED datasets need to include patients that were in the ED and treated/released, as well as a subset of inpatient hospitalizations that were admitted through the ED.

In addition, specific criteria indicate how to select inpatient hospitalizations that are admitted from an emergency department.

"Restrict the dataset to patients who were admitted from an ED using the following criteria:
- *Point of origin code indicates emergency department, or*
- *CPT codes: 999281-99285, or*
- *Revenue codes: 0450-0459, or*
- *Positive ED charges*

While there are multiple options for selecting hospitalizations that were admitted via the ED, many grantees use a variable indicating the source or point of origin (first bullet point above) and a code indicating ED as the method by which to include this sub-set of data in their ED visit datasets.

VARIABLES TO DETERMINE ADMITTANCE TO HOSPITAL

The SOURCE variable in inpatient hospitalization records is one way to capture the source of the admission. For the "SOURCE" variable, there are 15 different options, including "emergency department" (code = 7). The code for "emergency department" was discontinued on 7/1/2010. The "POINT OF ORIGIN" variable provides another avenue to capture the sub-group of inpatient hospitalizations admitted through the ED but is not available in data sets for all grantees. Because not all grantees have access to the "POINT OF ORIGIN" variable, if they were using the "SOURCE" variable as a proxy, this would lead to the necessity to find another way to include the hospitalizations that were admitted through the ED as of 7/1/2010.

Because this sub-set is a smaller group of the entire ED visit data set, it's possible that a grantee using the "SOURCE" variable to include hospitalizations that were admitted through the ED may not have noticed that the "SOURCE" variable no longer captured hospitalizations that were admitted through the ED.

This Appendix lays out this information so grantees can make informed decisions in effectively and accurately selecting the sub-group of hospitalizations that were admitted through the ED and including them in the ED visit dataset, per CDC requirements.

IMPORTANT POINTS TO CONSIDER IN PREPARATION OF DATASETS

- If your state/city is using the "SOURCE" variable, the code for ED was discontinued on July 1, 2010. Therefore, as of this date, using this variable to identify hospitalizations admitted through the ED is no longer effective and this subgroup of data will not be included. If the only way a grantee is capturing these data is using the "SOURCE" variable and that grantee makes no effort to capture these data by one of the other methods, datasets from 2010 will likely be missing that subset of data.

- Even prior to the discontinuation of the ED option in the "SOURCE" variable, this variable was poorly coded and not accurate and effective in capturing hospitalizations that were admitted through the ED.

- Grantees should communicate with their data stewards to understand and select the best way to capture the sub-group of hospitalizations that were admitted through the ED. Some grantees don't only use one source, but multiple ways to capture this subgroup (e.g., point of origin and revenue codes).

- If your state/city was/is using the "SOURCE" variable to select hospitalizations that were admitted through the ED, you should determine another way to include these data starting on 7/1/10. It is preferable to complete an entire year of data using the same method. This may involve resubmitting 2010 data and updating the accompanying metadata.

- Changes in the way that grantees select hospitalizations that were admitted through the ED should be clearly documented in the metadata for that dataset.

- Grantees that change the methodology by which they select the hospitalizations admitted through the ED (e.g., changing from using the "SOURCE" variable in 2009 to a "flag" variable that indicates any ED charges in 2010) may want to look at the data over a longer period to see if the change in methodology influenced the data. Any deviations in the data should be noted in the metadata for that data set and year.

- If a grantee loses the method by which they select hospitalizations that are admitted through the ED (e.g., the "SOURCE" variable code for ED was discontinued) and they have no other method to select these data, if possible, the grantee should work with their data steward to explore other options to select these data. (For example, the grantee might inquire about the data steward creating a "flag" variable to indicate that there were positive ED charges. It is ideal for this variable to be created/included for the entire year during which the variable is lost.)

- There may be cases when a grantee loses the ability to select hospitalizations that were admitted through the ED (e.g., the "SOURCE" variable code for ED was discontinued) and after working with their data steward, does not have the ability to include this subset of data in any other way. If this is the case, the grantee should contact the CDC to discuss the issue at hand and determine a way to solve it. Metadata should always reflect exactly what data is included (and not included) in the dataset.

- It should be noted that there may be grantees that may not be able to capture the subset of data (hospitalizations admitted through the ED) due to the way their data systems and data sets are established in their state/city.

- If, for whatever reason, the sub-set of data including hospitalizations that were admitted through the ED is not able to be included, is should be noted that data without that specific sub-set are not comparable to data that contain the specific sub-set. This should be indicated in metadata, as well as appear as a footnote on tables/graphs which show multiple years. These references should occur on the national as well as the state portals, so that data users clearly understand that data should not be compared.

- Documentation from the Agency for Healthcare Research and Quality (AHRQ) indicates that overall, ED admissions to inpatient services runs about 16%. This is a benchmark that grantees can use to understand the quality of their data. Note that this is not one specific health condition but includes all admissions.

SUGGESTED METHODS FOR THE EVALUATION OF COMPLETENESS OF ED VISIT DATASETS

1) For grantees that have the ability, perform a comparison of the four different methods (point of origin code indicating ED, CPT codes, revenue codes, positive ED charges) by which hospitalizations admitted through the ED are captured. It would be interesting to note the differences, if any, in using one method over the other to capture this sub-group. In addition, are there differences (and what are they) when more than one method is used to capture the sub-group.

2) Go back to the data beginning in 2000 and determine if there are changes that seem to correspond with changes in the way data are collected.

3) One possibility for exploring rates is for a grantee to refer to their published state-specific rates (on the Healthcare Cost and Utilization Project website) and compare these rates to the rates that are on the national portal. If there are significant differences, then this provides strong proof that grantees are not getting enough data (or variables) from data stewards in order to report accurate data. Data stewards and/or hospital associations should work to provide a way for grantees to capture hospitalizations that are admitted through the ED if this is not available. If we are certain that inconsistencies are present in the data, it's important to get data stewards in all states on notice that reporting is not consistent to the national program.

4) Documentation from the Agency for Healthcare Research and Quality (AHRQ) indicates that overall, ED admissions to inpatient services runs about 16%. This is a benchmark that grantees can use to understand the quality of their data. For example, grantees can run their data to see the percentage of hospitalizations that are admitted through the ED. If states are finding 5% of inpatient hospitalizations coming in through the ED (or 40%), then this is a signal that something is wrong, and the issue needs to be addressed.

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