

Severe Asthma v1

Definition Factsheet & Technical Brief

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Definition Purpose: This definition intends to capture emergency department visits for asthma with acute exacerbation, asthma attacks, bronchospasm, status asthmaticus, and severe asthma.

New or Revised Definition: New Definition

Date Added to ESSENCE: July 2025

Definition Description: Previously, asthma subject matter experts (SMEs) from CDC and state health departments evaluated the CDC Asthma CCDD v1 definition to assess utility of the syndrome in capturing asthma-related emergency department (ED) visits. The definition was found to capture ED visits involving people with asthma but was not specific to severe forms of asthma emergencies. Therefore, this new definition intends to identify visits for asthma with acute exacerbation, asthma attacks, bronchospasm, status asthmaticus, and severe asthma.

Use Case(s)

Case-finding: Tertiary

Trend monitoring: Primary

Early outbreak detection: Secondary

Emergent Condition Not Intended as Use Case

Justification: CDC Asthma CCDD v1 definition did not capture visits specific to severe forms of asthma emergencies. Severe Asthma v1 was developed to accommodate this.

Data Source During Development: Emergency Department Visits. Chief Complaint Query Validation dataset (CCQV) in ESSENCE.

Development Methods: The CDC National Syndromic Surveillance Program (NSSP) team and SMEs from the CDC Asthma and Air Quality Branch worked with four jurisdictions (CO, KY, Polk Co. FL, NM) to pilot a v1 definition using ED data.

1. The NSSP team and asthma SMEs evaluated the chief complaint text and diagnostic codes in the CDC Asthma CCDD v1 definition and in a draft query developed in the advanced query tool (AQT) by the asthma SMEs, assessing which terms are necessary for identifying severe manifestations of asthma and what additional terms should be included.
2. The first iteration of the new definition (see Appendix) was created by the NSSP team and shared with asthma SMEs for their review.

- Based on the comments and edits from CDC asthma SMEs, two additional iterations of the definition were made before a final draft of the definition was shared with jurisdictions for validation.

Validation Methods:

- The jurisdiction validation worksheet was shared with four jurisdictions (CO, KY, Polk Co. FL, NM). Participants were asked to answer questions about the criteria and calculate the positive predictive value (PPV) based on criteria for true positive/probable, undetermined, and false positive/ruled out visits.
- During the validation process, the criteria for true positives and undetermined visits were refined and more specific examples were provided to ensure accurate classification.
- All jurisdictions answered questions and calculated PPVs in the worksheet and the results were reviewed by the NSSP team and asthma SMEs.

Validation Results:

PPV was calculated based on the number of true positive and probable visits divided by total number of visits. The PPV was 92% in CO, 62% in KY, 85.6% in Polk Co. FL, and 83% in NM. Based on the validation results, there were no suggestions for inclusion or exclusion terms to be added or removed so no additional changes were made to the definition.

Definition Fields and Structure:

The Chief Complaint Discharge Diagnosis (CCDD) parsed field is used to query both the discharge diagnosis codes and chief complaint free text, and exclusions are incorporated as necessary.

- Inclusion based on complaint free text terms related to severe forms of asthma emergencies:
 - The visit is included if it contains:
 - A chief complaint related to asthma attack – (“asthma attack” or “asma attack” or “ashtma attack” or “asthama attack” or “asthmia attack”) **OR**
 - A chief complaint for asthmaticus – (“asthmaticus”) **OR**
 - A chief complaint for bronchospasm – (“bronchospasm”) **OR**
 - A chief complaint related to severe asthma – (“severe asthma” or “severe asma” or “severe ashtma” or “severe asthama” or “severe asthmia”) **OR**
 - The visit is included if it contains the following set of terms nested together:
 - A chief complaint term related to asthma – (“asthma” or “ asma” or “ashtma” or “asthama” or “asthmia”) **AND**
 - A chief complaint term related to acute exacerbation – (“acute” or “exacerbation”) **OR**
- Inclusion based on ICD-10 discharge diagnosis codes related to bronchospasm, asthma with acute exacerbation, or asthma with status asthmaticus:
 - The visit is included if it contains:
 - A discharge diagnosis code related to mild intermittent asthma – (J45.21 or J45.22) **OR**
 - A discharge diagnosis code related to mild persistent asthma – (J45.31 or J45.32) **OR**
 - A discharge diagnosis code related to moderate persistent asthma – (J45.41 or J45.42) **OR**
 - A discharge diagnosis code related to severe persistent asthma – (J45.51 or J45.52) **OR**
 - A discharge diagnosis code related to unspecified asthma – (J45.901 or J45.902) **OR**
 - A discharge diagnosis code related to bronchospasm – (J45.990 or J98.01) **OR**
- Inclusion based on ICD-9 discharge diagnosis codes related to bronchospasm, asthma with acute exacerbation, or asthma with status asthmaticus:
 - The visit is included if it contains:
 - A discharge diagnosis code related to extrinsic asthma – (493.01 or 493.02) **OR**
 - A discharge diagnosis code related to intrinsic asthma – (493.11 or 493.12) **OR**
 - A discharge diagnosis code related to chronic obstructive asthma – (493.21 or 493.22) **OR**
 - A discharge diagnosis code related to unspecified type of asthma – (493.91 or 493.92) **OR**
- Inclusion based on SNOMED discharge diagnosis codes related to bronchospasm, asthma with acute exacerbation, or asthma with status asthmaticus:
 - The visit is included if it contains:
 - A discharge diagnosis code related to exacerbation of asthma – (281239006 or 708090002) **OR**
 - A discharge diagnosis code related to exacerbation of allergic asthma – (762521001 or 782513000 or 782520007 or 10674791000119101 or 707981009 or 10675911000119109 or 10676271000119104 or 10676431000119103 or 10675471000119109) **OR**

3. A discharge diagnosis code related to exacerbation of intermittent asthma – (425969006) **OR**
 4. A discharge diagnosis code related to exacerbation of mild persistent asthma – (707445000 or 707981009) **OR**
 5. A discharge diagnosis code related to exacerbation of moderate persistent asthma – (707446004 or 734905008 or 707980005) **OR**
 6. A discharge diagnosis code related to exacerbation of severe persistent asthma – (707447008 or 707979007) **OR**
 7. A discharge diagnosis code related to exacerbation of immunoglobulin E-mediated allergic asthma – (708093000 or 708095007) **OR**
 8. A discharge diagnosis code related to life threatening acute exacerbation – (734904007) **OR**
 9. A discharge diagnosis code related to exacerbation caused by thunderstorms – (829976001) **OR**
 10. A discharge diagnosis code related to refractory exacerbation of asthma – (733858005) **OR**
 11. A discharge diagnosis code for acute exacerbation of chronic asthmatic bronchitis – (442025000) **OR**
 12. A discharge diagnosis code related to exacerbation of asthma co-occurrent with allergic rhinitis – (10674711000119105 or 10675991000119100 or 10676511000119109 or 10675551000119104) **OR**
 13. A discharge diagnosis code for chronic obstructive asthma co-occurrent with acute exacerbation of asthma – (10692721000119102)
- There are no exclusions in this query.

Limitations:

Although the syndrome definition has an emphasis on identifying visits for severe forms of asthma emergencies, other respiratory diseases and other conditions can be attributed to similar symptoms of wheezing, coughing, and chest pain so it may be difficult to determine whether an asthma emergency or another condition is the main reason for the visit.

Detailed Definition Components

Table 1. *Inclusion and exclusion terms.*

Variable Type	Terms	Description
<i>Inclusions</i>		
Discharge Diagnosis: ICD-10-CM	J45.21	Mild intermittent asthma with (acute) exacerbation
	J45.22	Mild intermittent asthma with status asthmaticus
	J45.31	Mild persistent asthma with (acute) exacerbation
	J45.32	Mild persistent asthma with status asthmaticus
	J45.41	Moderate persistent asthma with (acute) exacerbation
	J45.42	Moderate persistent asthma with status asthmaticus
	J45.51	Severe persistent asthma with (acute) exacerbation
	J45.52	Severe persistent asthma with status asthmaticus
	J45.901	Unspecified asthma with (acute) exacerbation
	J45.902	Unspecified asthma with status asthmaticus
	J45.990	Exercise induced bronchospasm
	J98.01	Acute bronchospasm
Discharge Diagnosis: ICD-9-CM	493.01	Extrinsic asthma with status asthmaticus
	493.02	Extrinsic asthma with (acute) exacerbation
	493.11	Intrinsic asthma with status asthmaticus
	493.12	Intrinsic asthma with (acute) exacerbation
	493.21	Chronic obstructive asthma with status asthmaticus
	493.22	Chronic obstructive asthma with (acute) exacerbation
	493.91	Asthma, unspecified type, with status asthmaticus
	493.92	Asthma, unspecified type, with (acute) exacerbation
Discharge Diagnosis: SNOMED concepts	281239006	Exacerbation of asthma
	762521001	Exacerbation of allergic asthma
	425969006	Exacerbation of intermittent asthma

	707445000	Exacerbation of mild persistent asthma
	707446004	Exacerbation of moderate persistent asthma
	707447008	Exacerbation of severe persistent asthma
	708093000	Acute exacerbation of immunoglobulin E-mediated allergic asthma
	734904007	Life threatening acute exacerbation of asthma
	708090002	Acute severe exacerbation of asthma
	734905008	Moderate acute exacerbation of asthma
	829976001	Asthma exacerbation due to thunderstorm
	782513000	Acute severe exacerbation of allergic asthma
	708095007	Acute severe exacerbation of immunoglobulin E-mediated allergic asthma
	733858005	Acute severe refractory exacerbation of asthma
	782520007	Exacerbation of allergic asthma due to infection
	442025000	Acute exacerbation of chronic asthmatic bronchitis
	10674791000119101	Acute exacerbation of intermittent allergic asthma
	707981009	Acute severe exacerbation of mild persistent asthma
	10675911000119109	Acute severe exacerbation of mild persistent allergic asthma
	707980005	Acute severe exacerbation of moderate persistent asthma
	10676271000119104	Acute exacerbation of moderate persistent allergic asthma
	10676431000119103	Acute severe exacerbation of moderate persistent allergic asthma
	707979007	Acute severe exacerbation of severe persistent asthma
	10675471000119109	Acute severe exacerbation of severe persistent allergic asthma
	99031000119107	Acute exacerbation of asthma co-occurrent with allergic rhinitis
	10674711000119105	Acute severe exacerbation of asthma co-occurrent with allergic rhinitis
	10675991000119100	Acute severe exacerbation of mild persistent allergic asthma co-occurrent with allergic rhinitis
	10676511000119109	Acute severe exacerbation of moderate persistent asthma co-occurrent with allergic rhinitis
	10675551000119104	Acute severe exacerbation of severe persistent asthma co-occurrent with allergic rhinitis
	10692721000119102	Chronic obstructive asthma co-occurrent with acute exacerbation of asthma
Chief Complaint Terms – Nested Together with AND	“asthma”	“Acute” OR “Exacerbation”
	“ asma”	
	“ashtma”	
	“asthama”	
	“asthmia”	
Chief Complaint Terms	“asthma attack”	
	“asma attack”	
	“ashtma attack”	
	“asthama attack”	
	“asthmia attack”	
	“asthmaticus”	
	“bronchospasm”	
	“severe asthma”	
	“severe asma”	
	“severe ashtma”	
	“severe asthama”	
	“severe asthmia”	

Table 2. ESSENCE syntax

(,^asthma^,or,^ asma^,or,^ashtma^,or,^asthama^,or,^asthmia^,),AND,(,^Acute^,or,^Exacerbation^,),or,^asthma attack^,or,^asma attack^,or,^ashtma attack^,or,^asthama attack^,or,^asthmia attack^,or,^asthmaticus^,or,^bronchospasm^,or,^severe asthma^,or,^severe asma^,or,^severe ashtma^,or,^severe asthama^,or,^severe asthmia^,or,^;J45[2-5][12]^,or,^;J4590[12]^,or,^;J45990^,or,^;J9801^,or,^;493[0-29][12]^,or,^;281239006;,or,^;762521001;,or,^;425969006;,or,^;707445000;,or,^;707446004;,or,^;707447008;,or,^;708093000;,or,^;734904007;,or,^;708090002;,or,^;734905008;,or,^;829976001;,or,^;782513000;,or,^;708095007;,or,^;733858005;,or,^;782520007;,or,^;442025000;,or,^;10674791000119101;,or,^;707981009;,or,^;10675911000119109;,or,^;707980005;,or,^;10676271000119104;,or,^;10676431000119103;,or,^;707979007;,or,^;10675471000119109;,or,^;99031000119107;,or,^;10674711000119105;,or,^;10675991000119100;,or,^;10676511000119109;,or,^;10675551000119104;,or,^;10692721000119102;^

Use the following URL and click Configuration Options to see the query setup:

[**Syntax Plain Language Description:** The definition uses discharge diagnosis codes and free-text chief complaint terms. The definition requires that an emergency department visit contains a reference to asthma exacerbation, status asthmaticus, or bronchospasm by its discharge diagnosis code \(in at least one of the following: ICD-9-CM, ICD-10-CM, SNOMED diagnostic codes\), or by severe forms of asthma emergencies being listed in the chief complaint text.](https://essence2.syndromicsurveillance.org/nssp_essence/servlet/TemporalTimeSeriesViewer?datasource=va_hosp&startDate=29Dec2024&medicalGroupingSystem=essencesyndromes&userId=5024&endDate=29Mar2025&percentParam=noPercent&aqtTarget=TimeSeries&geographySystem=hospital&detector=nodetector&CCDDPparsedFreeText=(,%5E%5Easthma%5E,or,%5E%20asma%5E,or,%5E%5Eashtma%5E,or,%5E%5Easthama%5E,or,%5E%5Easthmia%5E,),AND,(,%5E%5EAcute%5E,or,%5E%5EExacerbation%5E,),or,%5E%5Easthma%20attack%5E,or,%5E%5Easma%20attack%5E,or,%5E%5Eashtma%20attack%5E,or,%5E%5Easthama%20attack%5E,or,%5E%5Easthmia%20attack%5E,or,%5E%5Easthmaticus%5E,or,%5E%5Ebronchospasm%5E,or,%5E%5Esevere%20asthma%5E,or,%5E%5Esevere%20asma%5E,or,%5E%5Esevere%20ashtma%5E,or,%5E%5Esevere%20asthama%5E,or,%5E%5Esevere%20asthmia%5E,or,%5E%5E;J45%5B2-5%5D%5B12%5D%5E,or,%5E;J4590%5B12%5D%5E,or,%5E;J45990%5E,or,%5E;J9801%5E,or,%5E;493%5B0-29%5D%5B12%5D%5E,or,%5E;281239006;%5E,or,%5E;762521001;%5E,or,%5E;425969006;%5E,or,%5E;707445000;%5E,or,%5E;707446004;%5E,or,%5E;707447008;%5E,or,%5E;708093000;%5E,or,%5E;734904007;%5E,or,%5E;708090002;%5E,or,%5E;734905008;%5E,or,%5E;829976001;%5E,or,%5E;782513000;%5E,or,%5E;708095007;%5E,or,%5E;733858005;%5E,or,%5E;782520007;%5E,or,%5E;442025000;%5E,or,%5E;10674791000119101;%5E,or,%5E;707981009;%5E,or,%5E;10675911000119109;%5E,or,%5E;707980005;%5E,or,%5E;10676271000119104;%5E,or,%5E;10676431000119103;%5E,or,%5E;707979007;%5E,or,%5E;10675471000119109;%5E,or,%5E;99031000119107;%5E,or,%5E;10674711000119105;%5E,or,%5E;10675991000119100;%5E,or,%5E;10676511000119109;%5E,or,%5E;10675551000119104;%5E,or,%5E;10692721000119102;%5E&timeResolution=weekly</p></div><div data-bbox=)

Appendix

Definition Evolution During Development

The Severe Asthma v1 definition using two queries below that were previously developed prior to the development of this definition:

1. Initial query for CDC Asthma CCDD v1 was used as a starting point for the CDC NSSP team and CDC asthma SMEs:

```
(,^asthma^,or,^[/  
]asma^,or,asma^,or,^asthama^,or,^asthma^,or,^asthmia^,or,^bronchospasm^,or,(,^(,^Airway^,or,^Disease^),AND,^  
Reactive^),or,(,^Airway^,AND,^Disease^),),or,^J45^,or,^[/ ]281239006^,or,^[/ ]195967001^,or,^[/  
]708038006^,or,^[/ ]405944004^,or,^[/ ]708090002^,or,^[/ ]56018004^,or,^[/ ]304527002^,or,^[/  
]1751000119100^,or,^[/ ]401000119107^,or,^[/ ]426979002^,or,^[/ ]409663006^,or,^[/ ]266364000^,or,^[/  
]31387002^,or,^[/ ]389145006^,or,^[/ ]442025000^,or,^[/ ]708093000^,or,^[/ ]135171000119106^,or,^[/  
]99031000119107^,or,^[/ ]135181000119109^,or,^[/ ]425969006^,or,^[/ ]370218001^,or,^[/ ]57546000^,or,^[/  
]312453004^,or,^[/ ]707446004^,or,^[/ ]427295004^,or,^[/ ]370219009^,or,^[/ ]233678006^,or,^[/  
]195949008^,or,^[/ ]707447008^,or,^[/ ]707445000^,or,^[/ ]233683003^,or,^[/ ]708094006^,or,^[/  
]55570000^,or,^[/ ]426656000^,or,^[/ ]707980005^,or,^[/ ]390798007^,or,^[/ ]5281000124103^,or,^[/  
]370221004^),ANDNOT,^not asthma^
```

2. A drafted query for a new asthma definition was developed by the CDC asthma SMEs using the AQT:

```
[CCANDDDCATEGORY="CDC Asthma CCDD v1"] AND [HASBEENEMERGENCY="1"] AND  
([DISCHARGEDIAGNOSISCOMBOFREETEXT="*asthma with acute*"] OR  
[DISCHARGEDIAGNOSISCOMBOFREETEXT="*asthma with (acute)*"] OR  
[DISCHARGEDIAGNOSISCOMBOFREETEXT="*exacerbation*"] OR  
[DISCHARGEDIAGNOSISCOMBOFREETEXT="*bronchospasm*"] OR  
[DISCHARGEDIAGNOSISCOMBOFREETEXT="*asthmaticus*"] OR  
[CHIEFCOMPLAINTCOMBOFREETEXT="*asthma*"] OR [CHIEFCOMPLAINTCOMBOFREETEXT="*ashtma*"] OR  
[CHIEFCOMPLAINTCOMBOFREETEXT="*asma*"] OR [CHIEFCOMPLAINTCOMBOFREETEXT="*shortness of  
breath*"] OR [CHIEFCOMPLAINTCOMBOFREETEXT="*sob*"] OR  
[CHIEFCOMPLAINTCOMBOFREETEXT="*wheez*"] AND [CHIEFCOMPLAINTCOMBOFREETEXT<>"*covid*"] AND  
[DISCHARGEDIAGNOSISCOMBOFREETEXT<>"*covid*"] AND  
[DISCHARGEDIAGNOSISCOMBOFREETEXT<>"*j45909*"] AND  
[DISCHARGEDIAGNOSISCOMBOFREETEXT<>"*j45.909*"])
```

First Iteration of the Severe Asthma v1 definition:

- The first draft of the definition, created in July 2024:
 - Included chief complaint text for asthma and its various misspellings nested together with chief complaint text for acute or exacerbation to capture acute exacerbations of asthma
 - Added chief complaint text for asthma attack and severe asthma with potential misspellings of asthma
 - Identified visits for reactive airway disease using nested terms of chief complaint text
 - Used discharge diagnosis codes (ICD-9, ICD-10, and SNOMED) for asthma with acute exacerbation and status asthmaticus
 - Included negations for uncomplicated asthma

(, (^asthma^,or,^asma^,or,^ashtma^,or,^asthama^,or,^asthmia^),AND,(^Acute^,or,^Exacerbation^),or,^asthma attack^,or,^asma attack^,or,^ashtma attack^,or,^asthama attack^,or,^asthmia attack^,or,^asthmaticus^,or,^bronchospasm^,or,^severe asthma^,or,^severe asma^,or,^severe ashtma^,or,^severe asthama^,or,^severe asthmia^,or,(, (^Airway^,or,^Disease^),AND,^Reactive^),or,(^Airway^,AND,^Disease^),),or,^J45[2-5][12]^,or,^J4590[12]^,or,^J45990^,or,^J683^,or,^J9801^,or,^4660^,or,^493[0-29][12]^,or,^281239006^,or,^762521001^,or,^425969006^,or,^707445000^,or,^707446004^,or,^707447008^,or,^708093000^,or,^734904007^,or,^708090002^,or,^734905008^,or,^829976001^,or,^782513000^,or,^708095007^,or,^733858005^,or,^782520007^,or,^442025000^,or,^10674791000119101^,or,^707981009^,or,^10675911000119109^,or,^707980005^,or,^10676271000119104^,or,^10676431000119103^,or,^707979007^,or,^10675471000119109^,or,^99031000119107^,or,^10674711000119105^,or,^10675991000119100^,or,^10676511000119109^,or,^10675551000119104^,or,^10692721000119102^,),andnot,(^J45[2-5]0^,or,^J45909^,)

Second Iteration of the Severe Asthma v1 definition:

- Changes made to the second draft of the definition, created in August 2024:
 - Modified the chief complaint nested terms for reactive airway disease
 - Removed exclusions for uncomplicated asthma
 - Modified J45 code to encompass all instances of asthma
 - Removed the discharge diagnosis codes for acute bronchospasm (J98.01), exercise-induced bronchospasm (J45.990), reactive airway disease syndrome (J68.3), and acute bronchitis (466.0)
 - Added the discharge diagnosis code for chronic obstructive pulmonary disease with (acute) exacerbation (J44.1) as a negation

(, (^asthma^,or,^asma^,or,^ashtma^,or,^asthama^,or,^asthmia^),AND,(^Acute^,or,^Exacerbation^),or,^asthma attack^,or,^asma attack^,or,^ashtma attack^,or,^asthama attack^,or,^asthmia attack^,or,^asthmaticus^,or,^bronchospasm^,or,^severe asthma^,or,^severe asma^,or,^severe ashtma^,or,^severe asthama^,or,^severe asthmia^,or,(^Airway^,AND,^Reactive^),or,(^Airway^,AND,^Disease^),or,^J45^,or,^493[0-29][12]^,or,^281239006^,or,^762521001^,or,^425969006^,or,^707445000^,or,^707446004^,or,^707447008^,or,^708093000^,or,^734904007^,or,^708090002^,or,^734905008^,or,^829976001^,or,^782513000^,or,^708095007^,or,^733858005^,or,^782520007^,or,^442025000^,or,^10674791000119101^,or,^707981009^,or,^10675911000119109^,or,^707980005^,or,^10676271000119104^,or,^10676431000119103^,or,^707979007^,or,^10675471000119109^,or,^99031000119107^,or,^10674711000119105^,or,^10675991000119100^,or,^10676511000119109^,or,^10675551000119104^,or,^10692721000119102^,),andnot,(^J441^,)

Third Iteration of the Severe Asthma v1 definition:

- Changes made to the third draft of the definition, created in September 2024:
 - Removed chief complaint nested terms for reactive airway disease
 - Reincluded discharge diagnosis codes for acute bronchospasm (J98.01) and exercise-induced bronchospasm (J45.990)
 - Modified the J45 codes to only include instances of asthma with acute exacerbation and status asthmaticus
 - Removed the discharge diagnosis code for chronic obstructive pulmonary disease with (acute) exacerbation (J44.1) as a negation

(, (^asthma^,or,^asma^,or,^ashtma^,or,^asthama^,or,^asthmia^),AND,(^Acute^,or,^Exacerbation^),or,^asthma attack^,or,^asma attack^,or,^ashtma attack^,or,^asthama attack^,or,^asthmia attack^,or,^asthmaticus^,or,^bronchospasm^,or,^severe asthma^,or,^severe asma^,or,^severe ashtma^,or,^severe asthama^,or,^severe asthmia^,or,^J45[2-5][12]^,or,^J4590[12]^,or,^J45990^,or,^J9801^,or,^493[0-29][12]^,or,^281239006^,or,^762521001^,or,^425969006^,or,^707445000^,or,^707446004^,or,^707447008^,or,^708093000^,or,^734904007^,or,^708090002^,or,^734905008^,or,^829976001^,or,^782513000^,or,^708095007^,or,^733858005^,or,^782520007^,or,^442025000^,or,^10674791000119101^,or,^707981009^,or,^10675911000119109^,or,^707980005^,or,^10676271000119104^,or,^10676431000119103^,or,^707979007^,or,^10675471000119109^,or,^99031000119107^,or,^10674711000119105^,or,^10675991000119100^,or,^10676511000119109^,or,^10675551000119104^,or,^10692721000119102^,^