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## Respiratory Illness Emergency Department Visits in the National Hospital Care Survey and the National Hospital Ambulatory Medical Care Survey

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### Abstract

**Purpose**—This report compares emergency department (ED) visits for respiratory illness between the 2014 National Hospital Care Survey (NHCS) and the 2014 National Hospital Ambulatory Medical Care Survey (NHAMCS) to determine the potential of researching respiratory illness in EDs with non-nationally representative NHCS data. The 2014 NHCS data linked to records in the 2014–2015 National Death Index (NDI) are also described to provide results on mortality after ED visits for respiratory illness.

**Methods**—For both surveys, encounters with respiratory illness were identified using diagnosis codes from the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD–9–CM). Weighted NHAMCS percentage estimates and their 95% confidence intervals (CIs) are shown for all demographic characteristics. Unweighted NHCS percentages are presented for all demographic and health care characteristics and are compared with weighted NHAMCS percentage estimates and used to report NHCS-only results. Standard errors and CIs are also presented for the NHCS unweighted percentages as a measure of variability.

**Results**—The percentage of NHCS ED visits for respiratory illness fell within NHAMCS measures of statistical variation for overall and specific respiratory illnesses. Additionally, respiratory illness by sex, older age groups, older men, and female patients of all ages fell within these measures. Compared with NHAMCS, NHCS had a higher percentage of ED visits for respiratory illness for both infants (under 1 year) and children (1–17 years) but a lower percentage for adults aged 18–44. NHCS data show that 15.2% of patients with ED visits for respiratory illness were hospitalized and of those hospitalized, 6.6% died within 90 days post-discharge. However, 11.1% of patients admitted to the intensive care unit died within 90 days.

**Conclusion**—Although the 2014 NHCS data are not nationally representative, the data may be used for exploratory analyses and have analytical capabilities that are not available in other hospital surveys.

**Keywords:** respiratory illness • mortality • emergency department • hospitalization

### Introduction

Diseases of the respiratory system account for approximately 10.6% of emergency department (ED) visits, more than any other body system (1). Two of the top 10 leading causes of death are respiratory illnesses: chronic lower respiratory diseases (fourth leading cause in 2018), accounting for 5.6% of all deaths, and influenza and pneumonia (eighth leading cause in 2018), accounting for 2.1% of all deaths (2). As part of the National Health Care Surveys, the National Hospital Ambulatory Medical Care Survey (NHAMCS) and the National Hospital Care Survey (NHCS) can be used to study the characteristics of respiratory illness in hospital-based settings.

To streamline data collection across health care settings and move toward collecting health care utilization data by electronic means, the National Center for Health Statistics (NCHS) launched NHCS. The goal of NHCS is to provide timely and reliable health care data from hospital-based settings. Although the 2014 NHCS data are not nationally representative because of low hospital participation (94 out of 581 hospitals provided any data, with 83 hospitals providing ED data), the information can



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provide insights into post-acute mortality associated with respiratory illness and describe characteristics of visits and subsequent deaths. NHCS collected information on over 4.5 million ED visits in 2014, providing an opportunity to explore public health concerns such as respiratory illness. In addition, the survey is designed to overcome limitations of other national hospital data collection systems, including NHAMCS. Through the collection of personally identifiable information (PII), NHCS has the capacity to follow patients across multiple settings in the same sampled hospital, identifying patients with repeat ED visits or intensive care unit (ICU) stays, and linking ED patient data to outside data sources like the National Death Index (NDI) to allow reporting of in-hospital and post-acute mortality.

Since 1992, NHAMCS has provided nationally representative data on ED visits, as well as outpatient department (OPD) visits, prior to 2018. In 2011, NHCS was launched to integrate NHAMCS and the National Hospital Discharge Survey (NHDS), which was discontinued after 2010, to streamline collection of hospital inpatient and ambulatory data.

Unlike other sources of hospital data collection systems, NHCS is designed to be linked to other data sources, including NDI, to permit the longitudinal examination of outcomes among those admitted to the ED or hospital.

In this report, NHAMCS national estimates for ED visits for respiratory illness by patient age and sex are compared with NHCS unweighted data. In addition, NHAMCS estimates for specific respiratory diseases are also compared with NHCS unweighted data. The purpose of the comparison is to determine whether the NHCS data show similar patterns as NHAMCS data for ED encounters for respiratory illness, even though NHCS data are not currently nationally representative. Based on the results of the comparison, the report will further demonstrate the analytical capabilities of NHCS data not possible with NHAMCS data, such as identifying patients with repeat ED visits and hospitalizations (including ICU stays), as well as examining in-hospital and post-acute 30-, 60-, and 90-day mortality for patients with respiratory illness.

## Methods

### Data sources

NHAMCS ED visit data for 2014 were used for this analysis (3,4). NHAMCS is a nationally representative survey of nonfederal general and short-stay hospitals conducted by NCHS. NHAMCS uses a multistage probability design with samples of geographic primary sampling units (PSUs), hospitals within PSUs, and patient visits within EDs and OPDs. In 2014, data were abstracted on 23,844 ED visits and entered into a standard patient record form. The weighted number of ED visits in 2014 was 141,420,460.

ED data from the 2014 NHCS were also used for this analysis (5). The target universe for NHCS is inpatient discharges and in-person visits made to EDs and OPDs in noninstitutional, nonfederal hospitals in the 50 states and the District of Columbia that have six or more staffed inpatient beds. Data are extracted from hospital billing or electronic health record systems and then transmitted electronically directly to NCHS or its designated agent. The 2014 sample consisted of 581 hospitals, 506 acute care hospitals, and 75 other specialty hospitals, including children's, psychiatric, long-term acute care, and rehabilitation hospitals. Since the launch of the survey in 2011, the participation rate has remained relatively low and was 16% in 2014. Because of the low participation rate, the data are currently unweighted and are not nationally representative. Data are reported from 83 sample hospitals in the 2014 NHCS, representing an unweighted total of 4,530,360 ED visits. In 2014, all NHCS data collected were from Uniform Bill (UB)-04 administrative claims. Unlike NHAMCS, NHCS collects PII (e.g., patient name and patient address), which allows for both following a patient across hospital settings and linkage to external data sources such as NDI.

### 2014 NHCS data linked to the 2014–2015 NDI

Through its data linkage program, NCHS has expanded the analytic utility of the data collected from NHCS by

linking it with mortality data from NDI, a component of the National Vital Statistics System (6). NDI is a centralized database of death record information compiled from state vital statistics offices. In collaboration with the states, NCHS established NDI as a resource for epidemiological follow-up studies and other types of health and medical research that require determination of the mortality status of study subjects. These mortality data are provided by the states under contract agreements with NCHS that specify how these data may be used, for what purposes, and at what cost. Currently, NDI contains about 85 million records from 1979 through 2018 from 50 states, the District of Columbia, New York City, Puerto Rico, and the U.S. Virgin Islands.

The linkage between 2014 NHCS patient records and the 2014–2015 NDI death certificate records was based on both deterministic and probabilistic methods. The probabilistic linkage method performed weighting and link adjudication as described in the Fellegi–Sunter paradigm, the foundational methodology used for record linkage (7). More information on the NHCS linkage methodology and the process for determining patient mortality status is available (8).

### Survey design differences of NHCS and NHAMCS

There are important differences in the survey design of NHCS and NHAMCS that may, in turn, lead to differences in the identification and enumeration of certain types of ED visits and the type of comparisons that can be conducted. NHCS uses a single-stage sample of visits to nonfederal, noninstitutional hospitals with 6 or more beds staffed for inpatient use in the 50 states and the District of Columbia. NHAMCS uses a four-stage probability design with samples of geographic PSUs, hospitals within PSUs, clinics within outpatient departments, and patient visits within clinics and emergency service areas. PSUs consist of a county, a group of counties, towns, townships, or a metropolitan statistical area (MSA). Like NHCS, NHAMCS includes nonfederal, noninstitutional hospitals in the 50 states

and the District of Columbia. NHCS used a stratified list sample of 581 hospitals, with strata defined by four types of hospitals (general acute, children's, psychiatric, and other). NHAMCS included general (medical or surgical) and children's general hospitals. Eight percent of NHCS hospitals are children's hospitals, but only 4% of NHAMCS hospitals are children's hospitals.

In NHCS, among the acute care hospitals, strata are also defined by bed size (less than 50, 50–99, 100–199, 200–499, and 500 or more) and area type (central city of large MSA, fringe of large MSA, small MSA, and non-MSA). NHAMCS defines size by the volume of ED and OPD visits and defines area type by MSA and non-MSA. Average length of stay (ALOS) is not used as an exclusion criterion for NHCS, thus expanding the sampling frame beyond short-stay hospitals with an ALOS of less than 30 days. Hospitals with an ALOS of more than 30 days is an exclusion criterion for NHAMCS. In addition, unlike NHAMCS, NHCS has no geographic qualifiers and no large certainty hospitals included in the sampling frame.

The mode of data collection is different for NHCS and NHAMCS. NHCS is an all-electronic data collection with administrative claims or billing data submitted by participating hospitals. Sampled hospitals are requested to transmit all their inpatient, ED, and OPD encounters over a 12-month period. Data collected in NHCS consist of patient PII (including patient name, address, and Social Security number), patient demographics, diagnoses, procedures, laboratory tests, and medications. Patient PII is used to create unique patient identifiers to follow patients over time and link to external data sources such as NDI, providing a more complete picture of patient care and post-acute mortality.

NHCS UB-04 administrative claims data exclude some types of ED visits, including those with an expected source of payment of charity care and self-pay, because a hospital bill may not have been created for these visits. Some NHCS data were collected from claims representing multiple hospital visits for ease of billing. An attempt was made to identify unique visits on bundled claims, but some ED visits may have been overcounted. It was not always possible to distinguish between services delivered in the ED and the inpatient department on bundled claims.

NHAMCS relies on medical record abstraction by U.S. Bureau of the Census field representatives. The data collection reporting period for NHAMCS is 4 weeks. A random sample of about 100 ED visits are selected from all visits during the reporting period, and data are manually abstracted directly from medical records by Census staff. Data collected include patient demographics, reason for visit, diagnoses, procedures, and medications but do not contain PII. More information on the sample design of NHAMCS is published elsewhere (4). Charity and self-pay ED visits are included in NHAMCS.

## ED visits for respiratory illness

ED visits for respiratory illness were defined as all visits with the primary diagnosis listed as one of the diseases in the respiratory system chapter (specifically codes 460–496) of the *International Classification of Diseases, Ninth Revision, Clinical Modification*. (ICD–9–CM) (9). The complete list of illnesses is shown in [Table 1](#).

## Post-acute mortality and time to death

Post-acute mortality includes all deaths occurring in and outside the hospital for ED patients with a respiratory illness in 2014. For patients with only one ED visit, the time frame to death was 90 days from their ED visit. For patients who had multiple ED visits, the time frame to death was 90 days from their last ED visit for a respiratory illness in 2014. Similarly, for patients with only

one hospitalization, the time frame to death was 90 days from their hospital discharge. For patients with multiple hospitalizations, the time frame to death was 90 days from their last discharge for a respiratory illness in 2014.

Cause of death in the NDI data is coded in the *International Classification of Diseases, 10th Revision, Clinical Modification* (ICD–10–CM). In this report, deaths are combined into Diseases of the respiratory system (J00–J98), Major cardiovascular diseases (I00–I78), Neoplasms (C00–C97), and Other causes. Diseases of the respiratory system are further broken down into Chronic lower respiratory disease (J40–J47), Influenza and pneumonia, (J09–J18), and Other respiratory disease (J00–J06, J20–J39, J60–J98) (2).

## Analysis

This report presents the total number of ED visits for respiratory illness and compares selected characteristics of these visits between NHAMCS and NHCS, including patient age and sex. In addition, NHAMCS estimates for specific respiratory diseases are also compared with NHCS unweighted data. Weighted percentage estimates and their 95% confidence intervals (CIs) are shown for all demographic characteristics using NHAMCS data. Unweighted percentages are presented for all demographic and health care characteristics using NHCS data. Standard errors and CIs are also presented for the NHCS unweighted percentages as measures of variability. If an NHCS unweighted percentage falls within the 95% CI of the corresponding NHAMCS percentage, then they are considered to be similar.

The ability of the NHCS data to track patients across hospital settings and to link to NDI are unique features of NHCS, which allow analyzing in-hospital and post-acute mortality.

## Results

The results are divided into two sections. The first section provides comparisons between unweighted NHCS data with weighted NHAMCS data for specific respiratory illnesses as well as

age and sex. The second section focuses on the unique features of NHCS, namely the examination of repeat ED visits, hospitalizations (including ICU stays), and mortality for patients with respiratory illness.

## Number and percentage of respiratory visits in NHAMCS and NHCS

Table 1 shows the number and percentages of ED visits for patients with a respiratory illness listed as the primary (first-listed) diagnosis (hereafter referred to as ED visits with a respiratory illness) for both NHCS and NHAMCS. There were 464,094 unweighted ED visits with a respiratory illness reported in NHCS. There were an estimated 13,933,000 weighted ED visits with a respiratory illness reported in NHAMCS.

- The 2014 NHCS unweighted percentage of ED visits with a respiratory illness (10.2% [95% CI: (10.2–10.2)]) was within the 95% CIs for the weighted 2014 NHAMCS (9.9% [95% CI: (9.0–10.7)]).

The number and percentage of ED visits with a respiratory illness by specific type of respiratory illness from NHCS and NHAMCS is shown in Table 2. Many percentages are similar for NHAMCS and NHCS. NHCS percentages were within the 95% CIs for the weighted 2014 NHAMCS estimates for three of the four broad respiratory illness categories, including acute respiratory infections, pneumonia and influenza, and chronic obstructive pulmonary disease and allied conditions. The other diseases of the upper respiratory tract category was the only category that was not within the 95% CIs for the weighted 2014 NHAMCS estimates. Variation was also observed for NHAMCS and NHCS for specific illnesses, including acute laryngitis and tracheitis, chronic sinusitis, asthma, and chronic airway obstruction, not elsewhere classified.

- NHAMCS data show that 50.5% [95% CI: (47.1–53.8)] of ED visits for respiratory illness were acute respiratory infections, compared with 51.1% of NHCS unweighted data.

- NHAMCS data show that 7.8% [95% CI: (5.4–10.8)] of ED visits for respiratory illness were other diseases of the upper respiratory tract, compared with 4.8% of NHCS unweighted data, which was lower than the NHAMCS 95% CIs.
- NHAMCS data show that 14.8% [95% CI: (12.5–17.3)] of ED visits for respiratory illness were pneumonia and influenza compared with 16.4% of NHCS unweighted data.
- NHAMCS data show that 27.0% [95% CI: (23.9–30.3)] of ED visits for respiratory illness were chronic obstructive pulmonary disease and allied conditions compared with 27.8% of NHCS unweighted data.

Most types of respiratory illnesses were within the 95% CIs for the weighted 2014 NHAMCS, except for acute laryngitis and tracheitis, chronic sinusitis, asthma, and chronic airway obstruction, not elsewhere classified. NHAMCS data show that 14.5% [95% CI: (12.3–17.0)] of ED visits for respiratory illness were for asthma, which was lower compared with 18.0% of NHCS unweighted data. In addition, NHAMCS data show that acute laryngitis and tracheitis (2.4%) was also

lower compared with NHCS unweighted data (3.8%), and chronic sinusitis (4.2%) and chronic airway obstruction, not elsewhere classified (1.8%) were higher compared with NHCS unweighted data (1.8% and 0.6%, respectively).

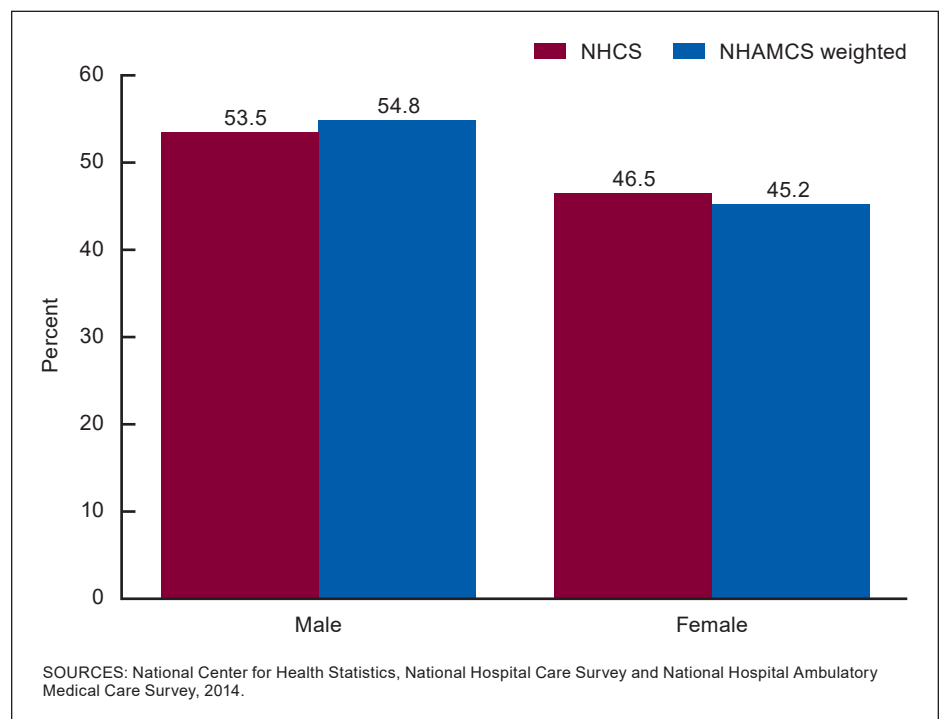
## Demographics of respiratory visits in NHAMCS and NHCS

Figure 1 and Table 3 show the distribution of ED visits for respiratory illness in 2014 NHCS and 2014 NHAMCS by sex. ED visits by sex were similar for NHCS and NHAMCS. Both surveys show more ED visits for respiratory illness for females.

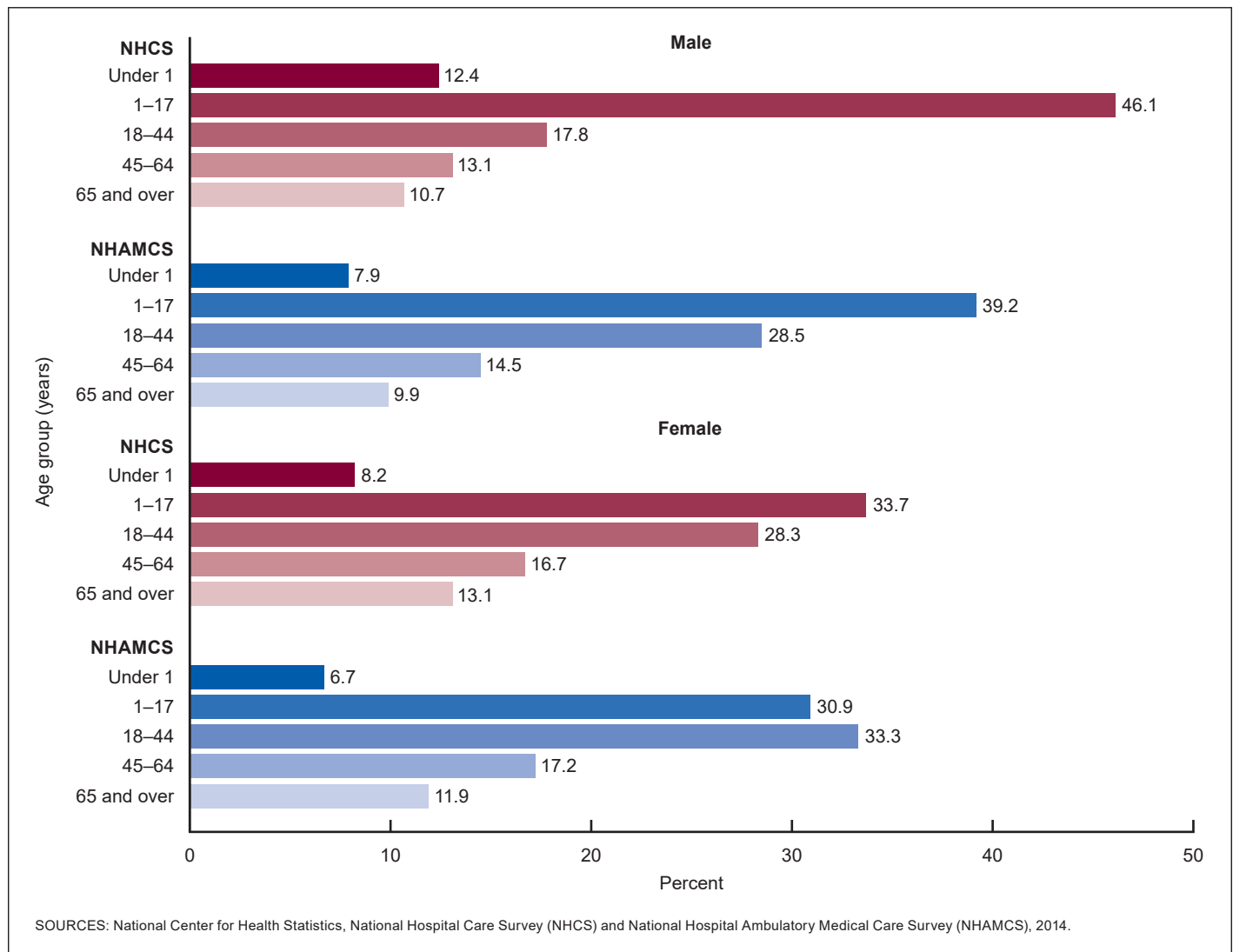
- NHAMCS data show that 54.8% [95% CI: (51.7–57.9)] of ED visits for respiratory illness were made by females compared with 53.5% of NHCS unweighted data.
- NHAMCS data show that 45.2% [95% CI: (42.1–48.3)] of ED visits for respiratory illness were made by males compared with 46.5% of NHCS unweighted data.

Figure 2 and Table 4 show the percentage distribution by age group and sex for ED visits with a respiratory illness

**Figure 1. Sex distribution of emergency department visits for patients with a respiratory illness listed as the primary diagnosis: National Hospital Care Survey, 2014, and National Hospital Ambulatory Medical Care Survey, 2014**



**Figure 2. Age distribution, by sex of emergency department visits for patients with a respiratory illness listed as the primary diagnosis: National Hospital Care Survey, 2014, and National Hospital Ambulatory Medical Care Survey, 2014**



for NHCS and NHAMCS. For both data systems, the percentage of overall ED visits with a respiratory illness is highest among children aged 1–17 years. Percentages from NHCS fell within the CIs of percentages from NHAMCS for adults aged 45 and over and for all age groups for females. The age distribution pattern for men aged 45 and over was similar for unweighted NHCS and the nationally representative NHAMCS, but differed for the younger age categories.

- Estimates of ED visits with respiratory illness among infants under 1 year (10.2%) and children aged 1–17 years (39.4%), and adults aged 18–44 (23.4%) fell outside of NHAMCS CIs (7.2% [95% CI: (5.5–9.2)], 34.6% [95% CI: (30.3–39.2)], and 31.1% [95% CI: (26.5–36.0)], respectively.
- For adults aged 45–64 (15.0%) and 65 and older (12.0%), the unweighted NHCS percentages were within the NHAMCS 95% CIs and were similar to the NHAMCS estimates (16.0% and 11.0%, respectively) for the respective age groups. Among visits for respiratory illness made by females, the age distribution was similar between NHCS and NHAMCS, and all NHCS estimates fell within NHAMCS CIs. The 2014 unweighted NHCS percentages show 8.2% of ED visits for respiratory illness by female infants under 1 year, 33.7% by girls aged 1–17 years, 28.3% by women aged 18–44, 16.7% by women aged 45–64, and 13.1% by women aged 65 and over.
- Among visits for respiratory illness made by males under age 45, NHCS estimates did not fall within NHAMCS CIs and were higher for infants under 1 year (12.4%) and boys aged 1–17 years (46.1%), and lower for men aged 18–44 (17.8%) compared with NHAMCS estimates (7.9%, 39.2%, and 28.5%, respectively).
- The 2014 unweighted NHCS percentages were similar to NHAMCS for ED visits with respiratory illness among men aged 45–64 (13.1%) and men aged 65 and over (10.7%). In NHAMCS, 14.5% [95% CI: (10.2–19.6)] of ED visits for respiratory illness were made by men aged 45–64, and 9.9% [95% CI: (6.5–13.3)] were made by men aged 65 and over.

(7.1–13.4)] were made by men aged 65 and over.

### Summary of NHCS and NHAMCS comparisons

Despite differences in survey design and the lack of national representativeness of the NHCS data, NHCS and NHAMCS data show several similarities when examining ED visits for respiratory illness. The overall percentage of visits for respiratory illnesses in NHCS were within the 95% CIs for the weighted 2014 NHAMCS. The percentage of visits according to the respiratory categories were similar across both surveys, except other diseases of the upper respiratory tract, which was the only group from NHCS that was not within the 95% CIs for the weighted 2014 NHAMCS estimates. Most types of respiratory illnesses were also within the 95% CIs for the weighted 2014 NHAMCS, except acute laryngitis and tracheitis, chronic sinusitis, asthma, and

chronic airway obstruction, not elsewhere classified. NHCS and NHAMCS data yielded comparable estimates for some age groups and for males and females. The NHCS percentages for patients aged 45 and over were within the 95% CIs for the weighted 2014 NHAMCS data. When examining age group by sex, the percentages of men aged 45–64, and 65 and over with ED visits for respiratory illness were similar to the percentages in NHAMCS. Among females, the age distribution was similar for all ages in NHCS and NHAMCS.

However, some differences between the unweighted NHCS and NHAMCS data were observed. Unweighted NHCS data show a lower percentage of visits for those aged 18–44 (23.4% versus 31.1%), but a higher percentage for children aged 1–17 years and infants under 1 year compared with NHAMCS (39.4% versus 34.6% and 10.2% versus 7.2%, respectively), and the NHCS estimates fell outside of the CIs of the NHAMCS estimates. Among males, unweighted

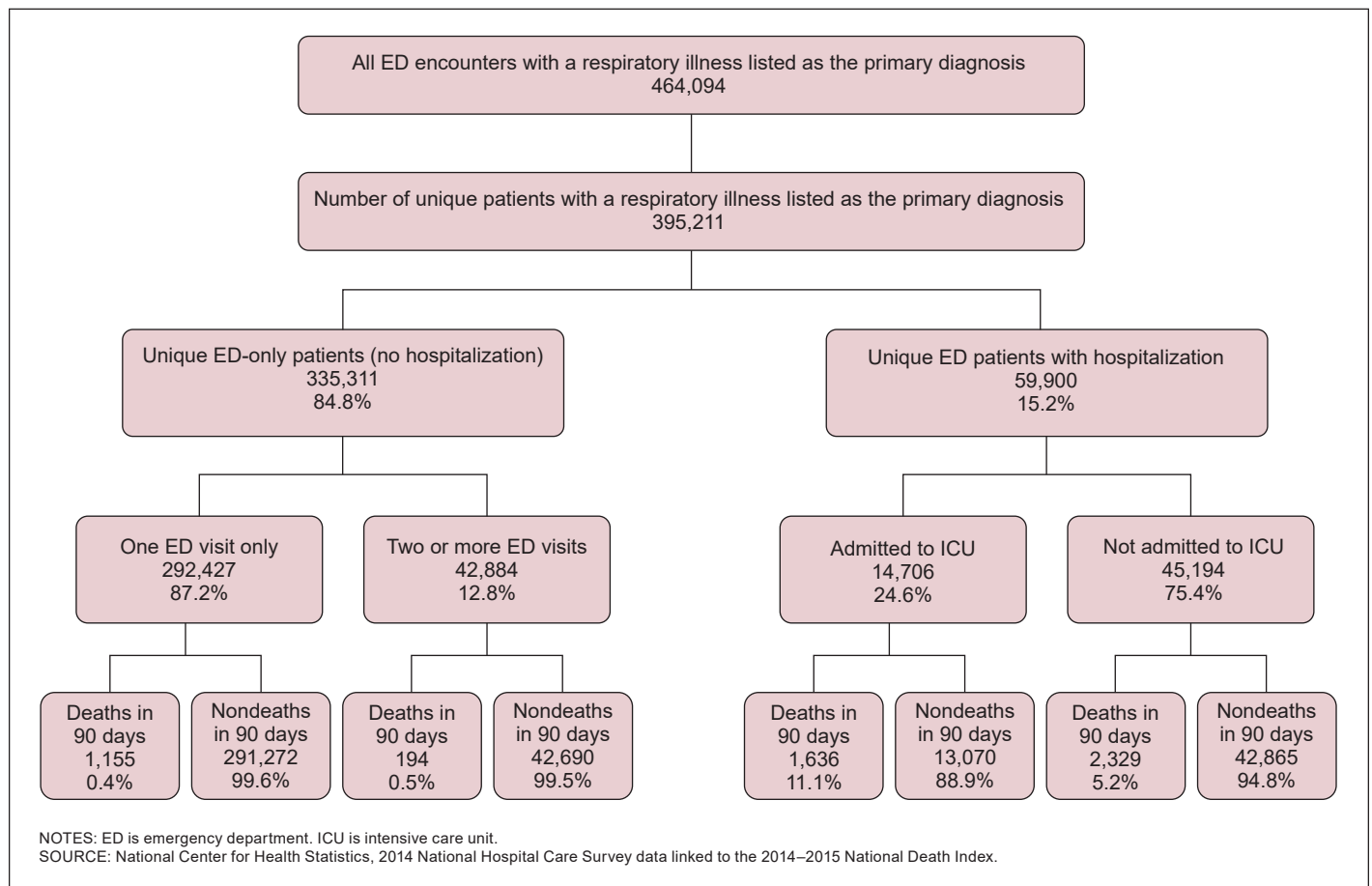
NHCS data show a higher percentage of boys aged 1–17 years and infants under 1 year with ED visits for respiratory illness (46.1% versus 39.2% and 12.4% versus 7.9%, respectively) but a lower percentage of men aged 18–44 (17.8% versus 28.5%) than NHAMCS. Users should be aware of these differences when using NHCS to examine ED visits for all respiratory illness for age groups under 45 years and by males in these same age groups, and note that additional differences by age and sex may occur for the specific types of illnesses, which were not evaluated in this report.

### Analysis unique to NHCS

#### 2014 NHCS encounters to patients

In the section below, repeat ED visits, hospitalizations (including ICU stays), and post-acute mortality for ED visits with respiratory illness using NHCS data are presented to illustrate the full analytical capability of NHCS.

**Figure 3. Number and percentage of emergency department encounters and patients with a respiratory illness listed as the primary diagnosis, by hospitalization status and single and return visits: National Hospital Care Survey, 2014**



In the 2014 NHCS ED data, 464,094 ED visits for respiratory illness were made by 395,211 unique patients. Using PII data to identify unique patients, multiple ED visits for the same patient were identified. Hospitalizations, ICU stays, and post-acute mortality were also identified. [Figure 3](#) illustrates the breakdown and percentages of all patients, unique ED-only patients by visit and deaths, and patients with a hospitalization by ICU stay and deaths.

- ED patients who went to the ED only (335,311) represented 84.8% of all ED patients with a respiratory illness ([Figure 3](#)), while the remaining 59,900 patients were admitted to the hospital after visiting the ED (15.2%).
- Patients with one ED visit only during 2014 (292,427) represented 87.2% of all ED-only patients without a hospitalization, while the remaining 12.8% of ED-only patients (42,884) returned to the ED two or

more times during 2014.

- Of the 59,900 ED patients with a respiratory illness who were hospitalized, 14,706 (24.6%) had an ICU stay, while the remaining 75.4% of hospitalized patients (45,194) did not have an ICU stay.

#### 2014 NHCS patients with a repeat visit and patients with an ICU stay

This section first describes the type of respiratory illness for the 335,311 ED patients who had no accompanying hospitalization (ED-only patients) and is grouped by whether they visited the ED one time in 2014 (292,427) or two or more times (42,884). Next, the 59,000 ED patients with a respiratory illness who were hospitalized are described by sex, age, and type of respiratory illness, according to whether the patient had an ICU stay.

- Five diagnoses accounted for the initial illness for 84.9% of all

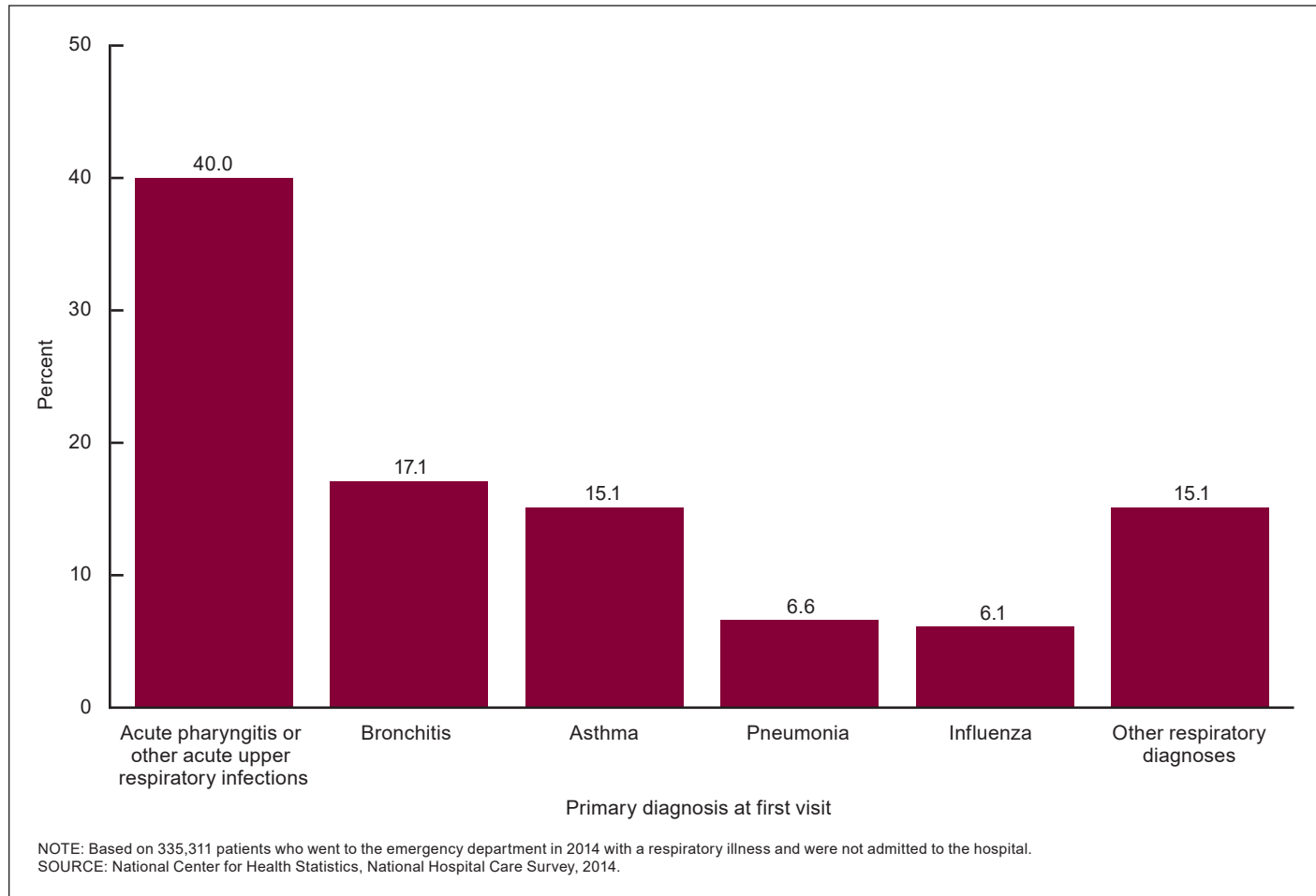
ED-only patients ([Figure 4](#)). Acute pharyngitis or other acute upper respiratory infection was the primary diagnosis for 40.0% of patients, followed by bronchitis (17.1%), asthma (15.1%), pneumonia (6.6%), and influenza (6.1%). Other respiratory diagnoses accounted for the remaining 15.1% of patients.

- Among patients with two or more visits, the primary diagnoses at the first and second visits were similar ([Figure 5](#)). Acute pharyngitis or other acute upper respiratory infection was the most common primary diagnosis, representing about 35% of both first and second visits, followed by asthma (~24%) and other respiratory diagnoses (23%).

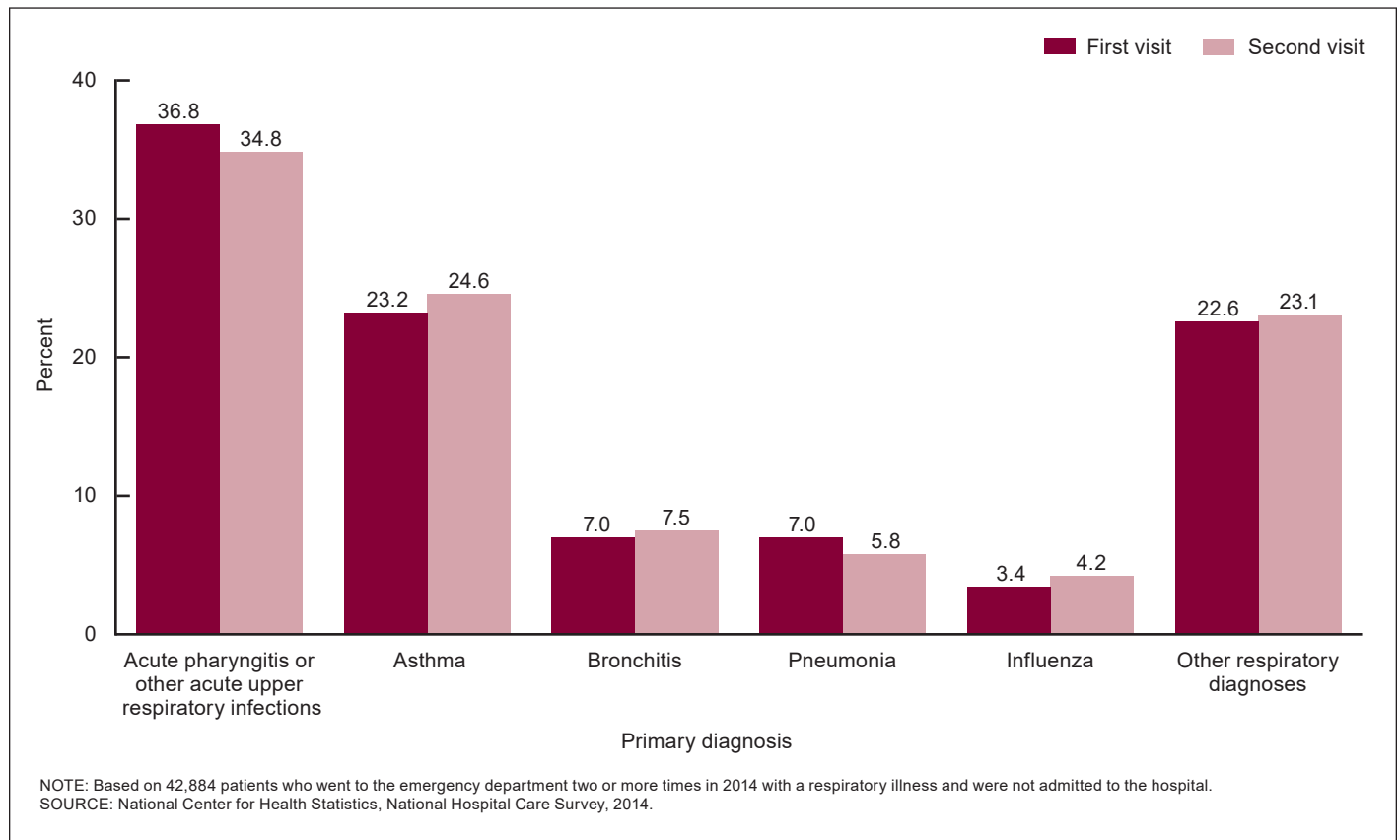
ICU hospitalizations were examined by age, sex, ALOS, and type of respiratory illness.

- As age increased, the percentage of hospitalizations that included an ICU

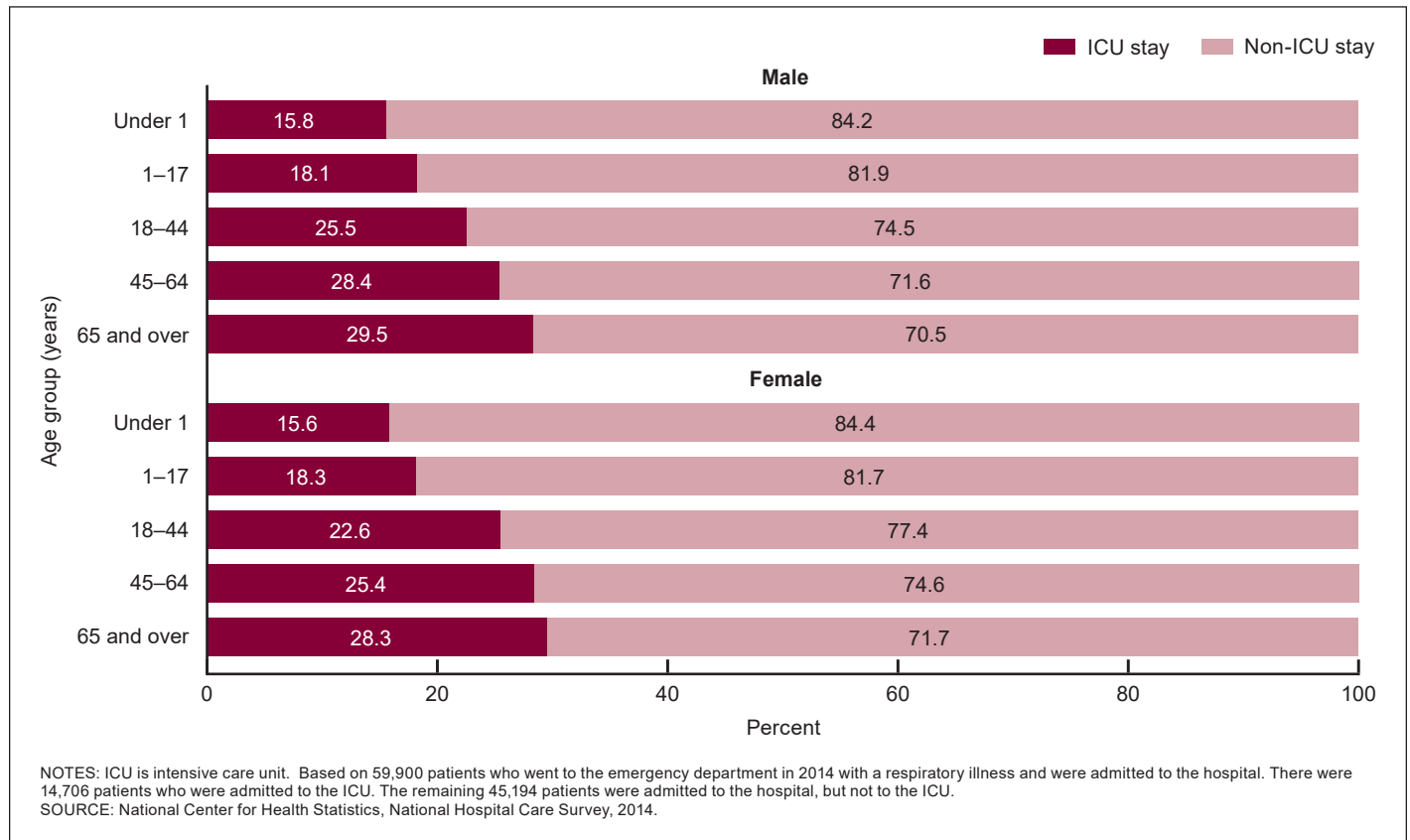
**Figure 4. Primary diagnosis for emergency department-only patients: National Hospital Care Survey, 2014**



**Figure 5. Primary diagnosis at first and second visits for emergency department-only patients with two or more visits: National Hospital Care Survey, 2014**



**Figure 6. Hospitalized patients with a respiratory illness, by age, sex, and intensive care unit stay: National Hospital Care Survey, 2014**





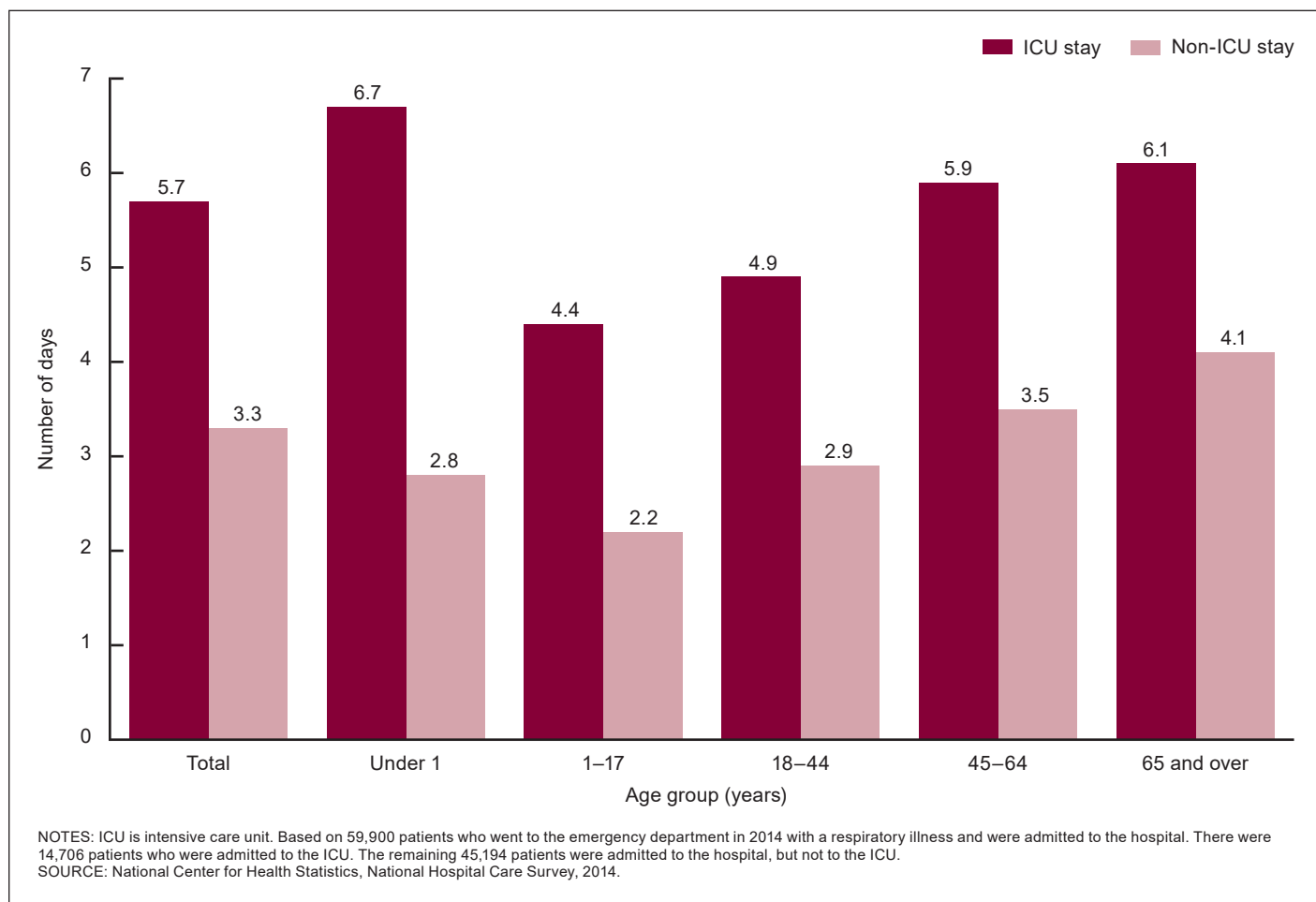
- stay increased for both females (15.6% for infants under 1 year to 28.3% for women aged 65 and over) and males (15.8% for infants under 1 year to 29.5% for men aged 65 and over) (Figure 6).
- For infants under 1 year and children aged 1–17 years, no difference was observed by sex in the percentage of patients who had an ICU stay (15.6% for infant girls and 15.8% for infant boys, and 18.3% for girls and 18.1% for boys). For all three adult age groups (18–44, 45–64, and 65 and over), a higher percentage of men had an ICU stay compared with women.
  - ICU patients had longer stays than hospitalized patients who were not admitted to the ICU. The ALOS was 5.7 days for ICU patients and 3.3 days for non-ICU patients (Figure 7). This same pattern was seen for all age groups.
  - Infants under 1 year admitted to the ICU had the longest ALOS at 6.7 days. Infants also had the largest difference in ALOS for ICU and non-ICU patients of the same age (4 days).
  - Children aged 1–17 years had a lower ALOS than any other age group, 4.4 days for ICU patients and 2.2 days for non-ICU patients.
  - For adults, as age increased, ALOS also increased for both ICU patients and non-ICU patients.
  - Four illnesses (pneumonia, bronchitis, asthma, and influenza) accounted for approximately 94% of the primary diagnoses for ED patients with a respiratory illness who were hospitalized (Figure 8). Pneumonia was the most common primary diagnosis for both ICU (41.2%) and non-ICU patients (36.6%).
  - For ICU patients, 27.7% had bronchitis, 19.9% had asthma, and 5.1% had influenza.
  - For non-ICU patients, 28.9% had bronchitis, 21.0% had asthma, and 5.4% had influenza.

### 2014 NHCS ED patients with a respiratory illness linked to NDI

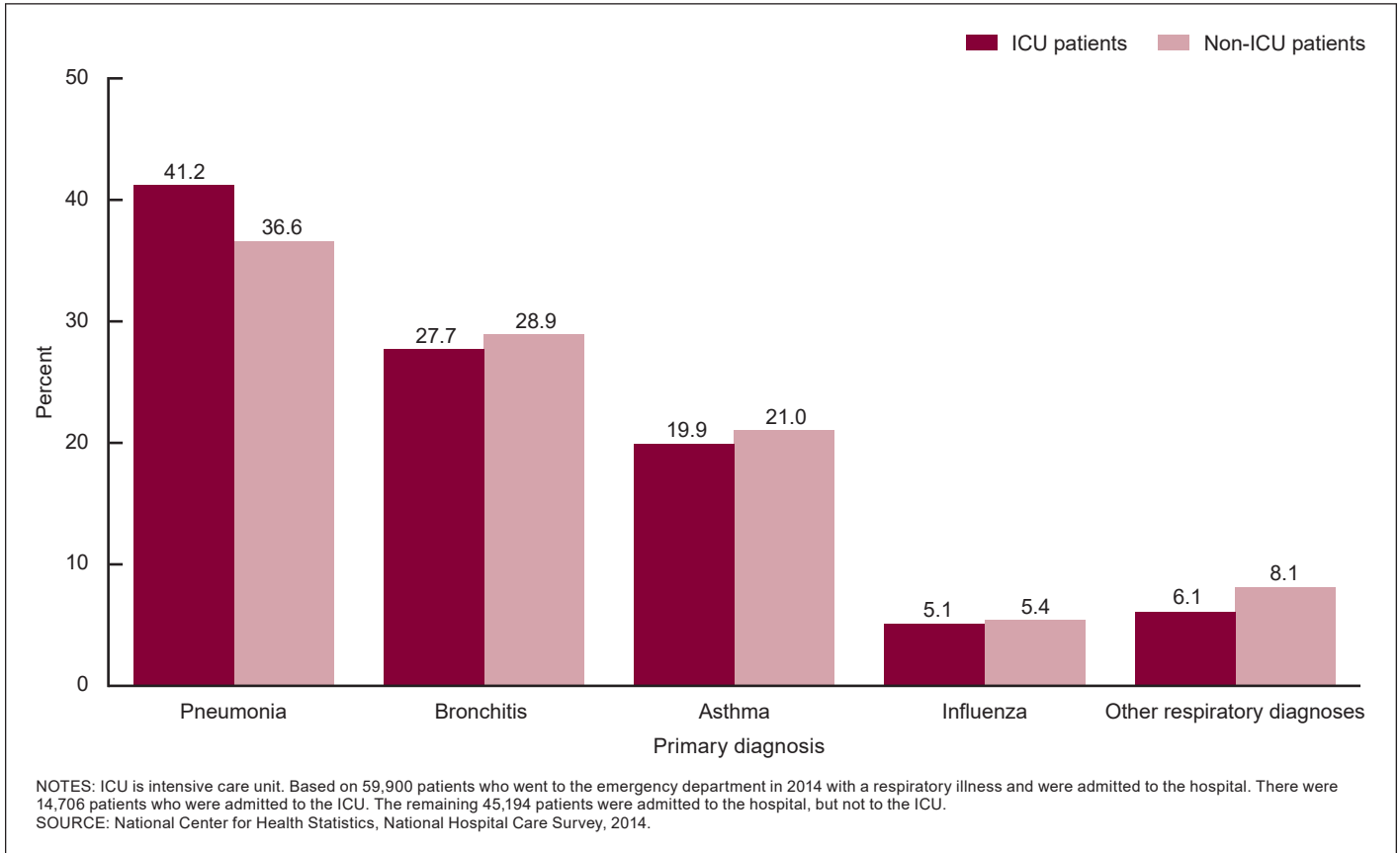
To examine patient mortality after a hospital discharge, the patient information collected from the 2014 NHCS was matched to the 2014 and 2015 NDI. There were 395,211 patients that were eligible for linkage to NDI. Linkage eligibility has been defined elsewhere (8). Figures 9–12 show the percentage of patients who died up to 90 days after their last ED visit for respiratory illness in 2014.

- In-hospital and post-acute mortality for ED-only patients with a respiratory illness in 2014 was

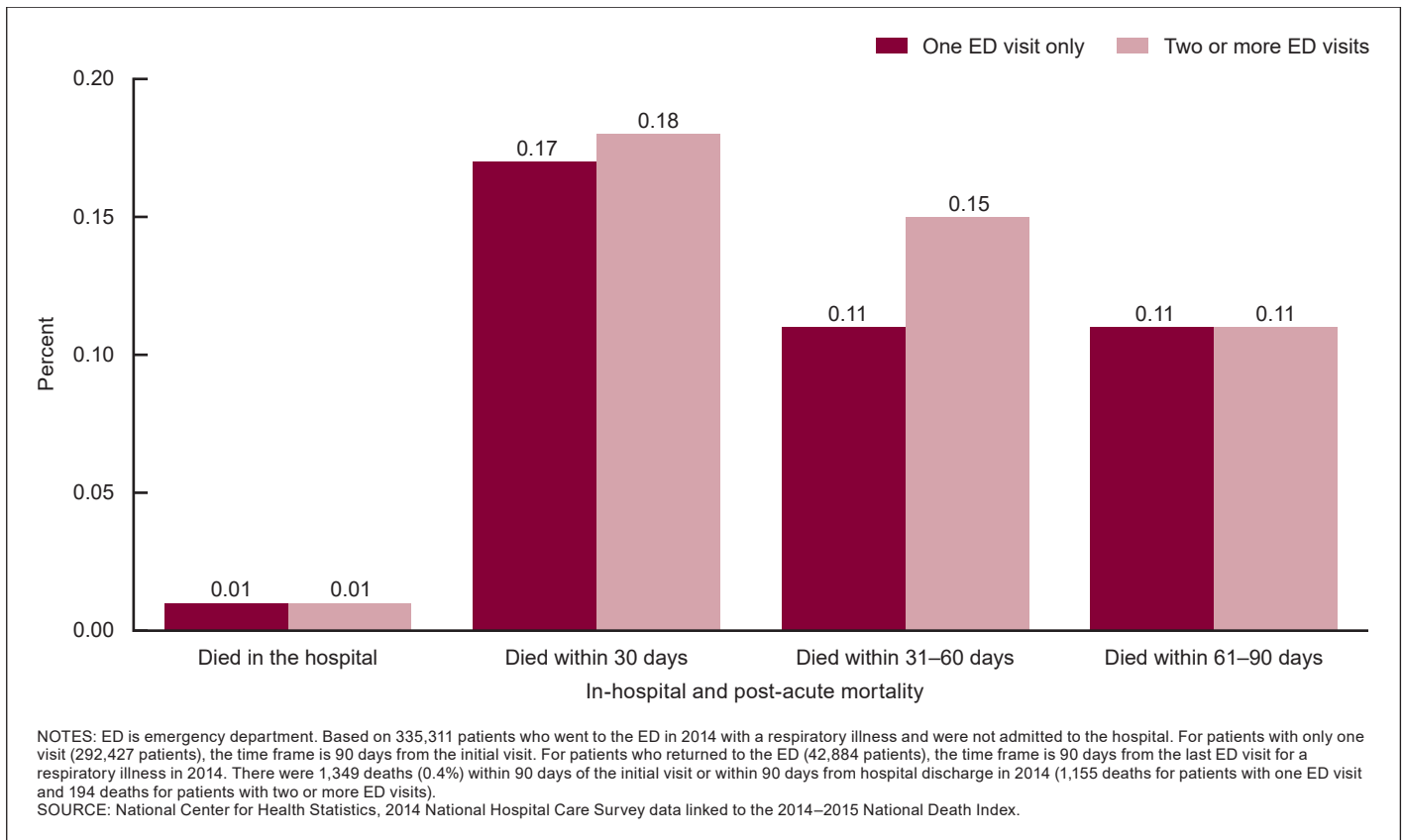
**Figure 7. Average length of stay for hospitalized patients with a respiratory illness, by age and intensive care unit stay: National Hospital Care Survey, 2014**



**Figure 8. Primary diagnosis for hospitalized patients: National Hospital Care Survey, 2014**

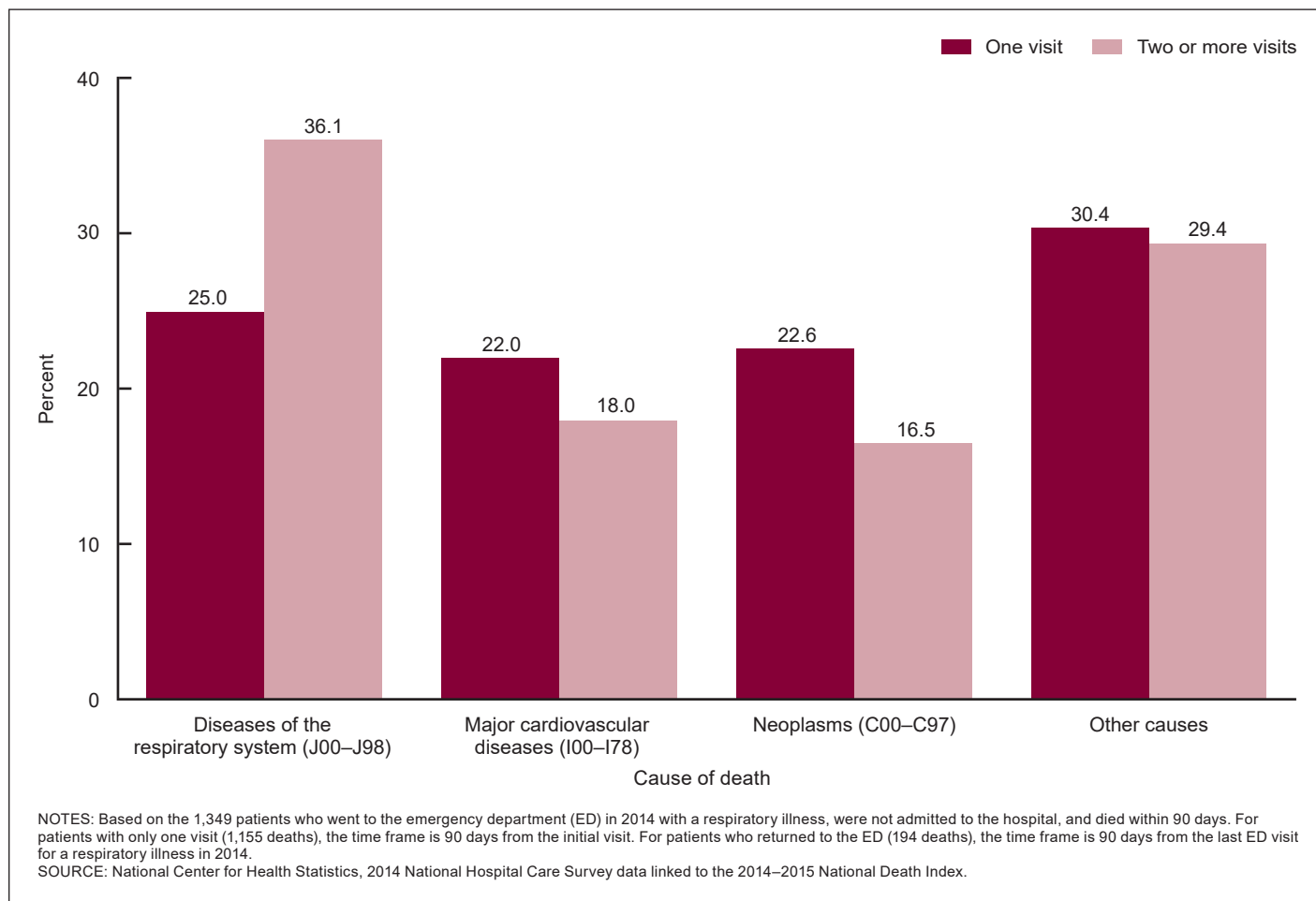


**Figure 9. In-hospital and post-acute mortality up to 90 days for emergency department-only patients with a respiratory illness, by whether they had a repeat visit to the emergency department: National Hospital Care Survey, 2014**

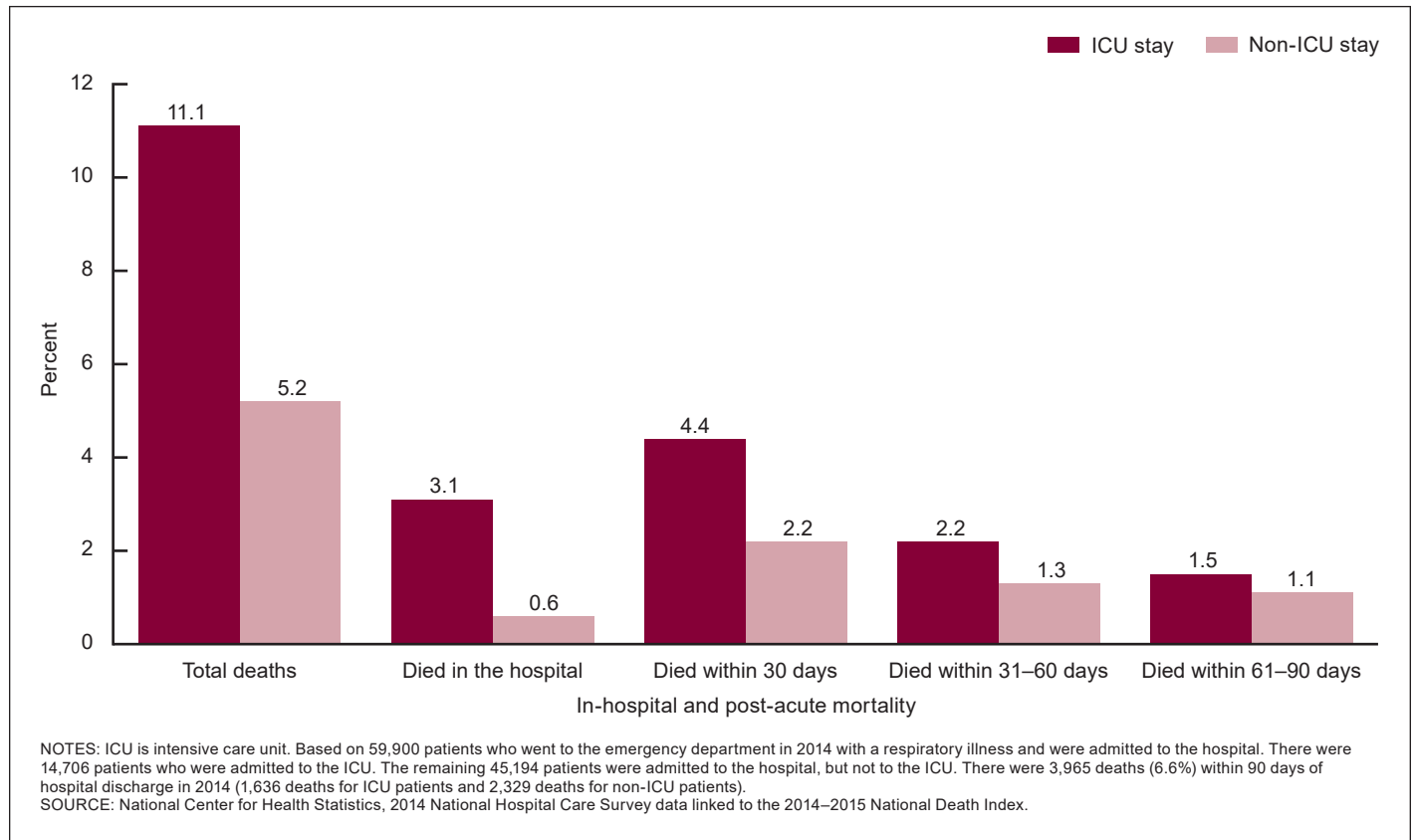


- examined by whether patients had a repeat visit to the ED (Figure 9). Among patients who visited the ED for a respiratory illness and were not hospitalized, 0.40% died (1,349 deaths) within 90 days of being discharged (1,155 deaths for patients with one ED visit and 194 deaths for patients with two or more ED visits). Mortality was lowest among those who died in the hospital (0.01%).
- Approximately 0.17% of ED-only patients died within 30 days and 0.11% died within 61–90 days. Little variation in mortality was observed by whether patients returned to the ED with a respiratory illness, except that a lower percentage of patients died within 31–60 days of the ED visit among those with one ED visit only (0.11%) compared with patients with two or more ED visits (0.15%). Overall, the percentage of patients who died within 90 days of the ED visit was extremely low.
  - Out of the three largest groups of causes of death (diseases of the respiratory system, major cardiovascular diseases, and neoplasms), respiratory illnesses accounted for the greatest percentage of deaths whether the patient had two or more visits to the ED (36.1%) or one visit (25.0%) (Figure 10). Major cardiovascular diseases and neoplasms accounted for similar percentages of deaths among patients with one visit to the ED (22.0%–22.6%) and two or more visits (16.5%–18.0%). Other causes of deaths accounted for 30.4% of deaths, regardless of the number of visits to the ED.
  - In-hospital and post-acute mortality for hospitalized patients with a respiratory illness in 2014 was examined by whether patients had an ICU stay (Figure 11). Among those hospitalized for a respiratory illness, 6.6% died (3,965 deaths) within 90 days of being discharged (1,636 deaths for ICU patients and 2,329 deaths for non-ICU patients).
  - Among those hospitalized for a respiratory illness, a larger percentage of ICU than non-ICU patients died within 90 days of being discharged (11.1% and 5.2%). This same pattern was seen for all time periods of mortality.
  - An estimated 3.1% of ICU patients and 0.6% of non-ICU patients died in the hospital. Among these patients, 4.4% of ICU patients and 2.2% of non-ICU patients died within 30 days of being discharged, 2.2% of ICU patients and 1.3% of non-ICU patients died between 31 and 60 days of being discharged, and 1.5% of ICU patients and 1.1% of non-ICU patients died between 61 and 90 days of being discharged.

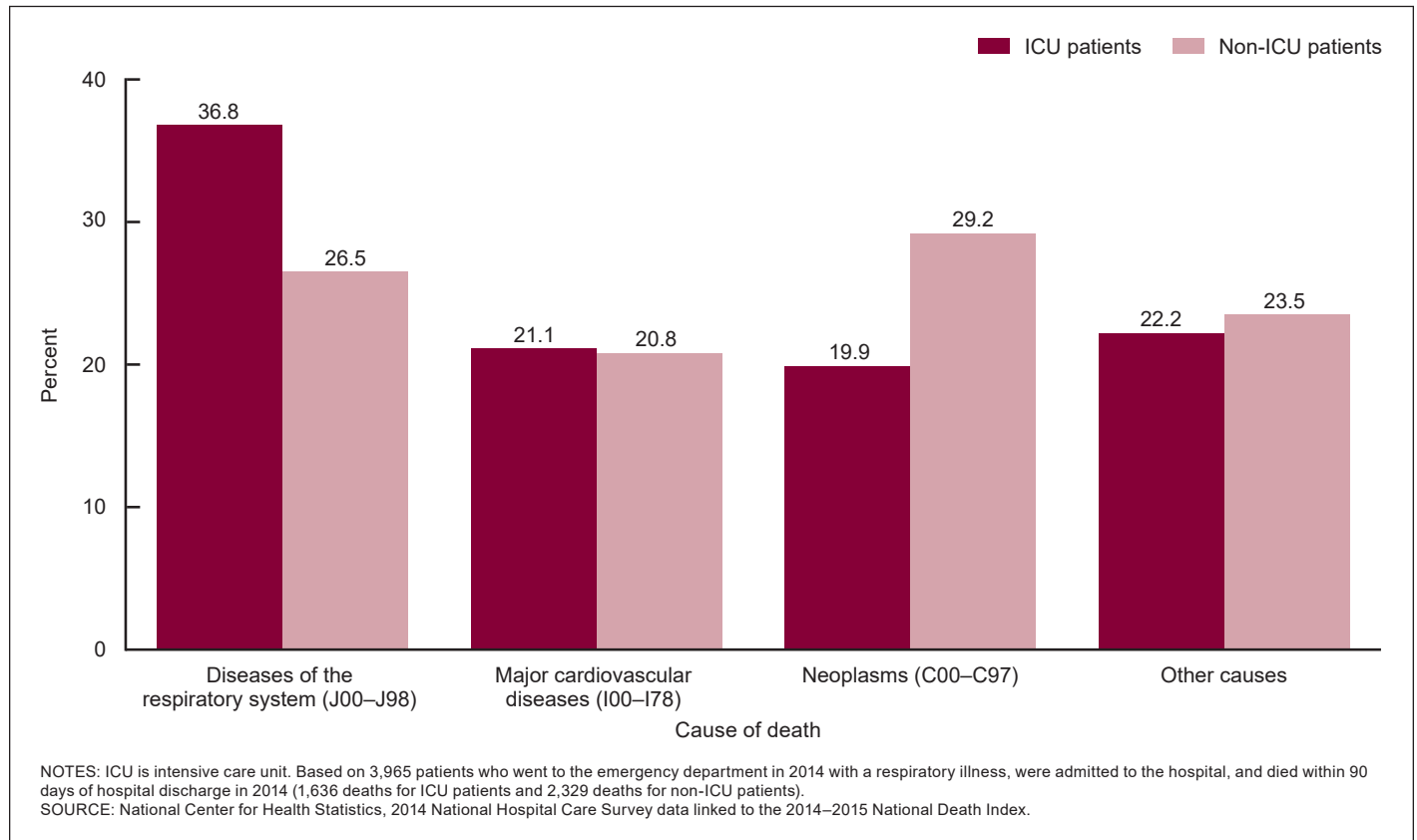
**Figure 10. Causes of death for emergency department patients with a respiratory illness who died within 90 days, by whether they had a repeat visit to the emergency department: National Hospital Care Survey, 2014**



**Figure 11. In-hospital and post-acute mortality up to 90 days for hospitalized patients with a respiratory illness, by whether they spent time in the intensive care unit: National Hospital Care Survey, 2014**



**Figure 12. Causes of death for hospitalized patients, by whether they spent time in the intensive care unit: National Hospital Care Survey, 2014**



- Respiratory illness was the most common cause of death for ICU patients, accounting for 36.8% of deaths within 90 days of being discharged (Figure 12). Neoplasms (19.9%) and major cardiovascular diseases (21.1%) were also common causes of death for ICU patients.
- Neoplasms were the most common cause of death for non-ICU patients, accounting for 29.2% of deaths within 90 days of being discharged, followed by respiratory illness, accounting for 26.5% of deaths. Major cardiovascular diseases (20.8%) were also a common cause of death for non-ICU patients.

## Summary

Respiratory illness accounts for the highest proportion of visits to the ED compared with other body systems (1). Data that provide detailed health care information on ED visits for respiratory illness that includes the ability to track patients across hospital settings, and to examine both repeat visits to the ED and post-acute mortality, may be useful for research on hospital visits for respiratory illness. Although not nationally representative, NHCS data have the potential to help fill this data void. NHCS data can be used for exploratory analyses that provide information on characteristics of patients with ED visits and hospitalizations for respiratory illness, and mortality following these visits. This report illustrates the potential of NHCS data and compares patient demographics and specific respiratory diseases with nationally representative NHAMCS ED data.

Analyzing the demographic distributions of the two data sources show similarities by sex and age distribution overall, but some age group-specific differences were observed by sex. NHCS and NHAMCS have similar distributions of male and female ED visits for respiratory illness. The two surveys also have similar distributions in age groups for patients aged 45 and over and for females of all age groups. NHAMCS had a higher percentage of ED visits for respiratory illness by adults aged 18–44 compared with NHCS. NHCS also had a larger distribution of visits for infants

(under 1 year) and children (aged 1–17 years) compared with NHAMCS. This same pattern was observed for males.

NHCS provides additional information on ED visits for respiratory illness that is not available elsewhere. It is possible to link NHCS to NDI to evaluate post-acute mortality and examine cause of death not available in other hospital data sets, including NHAMCS. The mortality information can be a tool for future research on hospital care for ED patients with respiratory illness and the mortality risk after the ED visit, especially for ICU patients. This report demonstrates the potential generalizability of NHCS data by sex and age, even though it is not nationally representative and shows that NHCS may serve as a novel data source to examine hospital-based care and post-acute mortality.

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**Table 1. Percentage and number of ED visits for patients with a respiratory illness listed as the primary diagnosis: National Hospital Care Survey, 2014, and National Hospital Ambulatory Medical Care Survey, 2014**

Characteristic	Unweighted (NHCS)							Weighted (NHAMCS)						
	Total	Percent	Standard error	Lower limit		Upper limit		Total	Percent	Standard error	Lower limit		Upper limit	
				95% CI	<i>n</i>	95% CI	<i>n</i>				95% CI	<i>n</i>		
Total ED visits . . . . .	4,530,360	...	...	...	...	...	...	141,420,000	...	11,464,000	...	118,951,000	...	163,889,000
ED visits with a respiratory illness . . . . .	464,094	10.2	644, 0.0	10.2	462,832	10.2	465,356	13,933,000	9.9	1,308,000, 0.4	9.0	11,351,045	10.7	16,514,597

... Category not applicable.

0.0 Quantity more than zero but less than 0.05.

NOTES: ED is emergency department. CI is confidence interval.

SOURCES: National Center for Health Statistics, National Hospital Care Survey (NHCS) and National Hospital Ambulatory Medical Care Survey (NHAMCS), 2014.

**Table 2. Number and percentage of primary diagnosis for ED encounters by patients with a respiratory illness listed as the primary diagnosis: National Hospital Care Survey, 2104, and National Hospital Ambulatory Medical Care Survey, 2014**

Name and ICD-9-CM code <sup>1</sup>	Unweighted (NHCS)					Weighted (NHAMCS)				
	Total	Percent	Standard error	Lower limit (95% CI)	Upper limit (95% CI)	Total	Percent	Standard error	Lower limit (95% CI)	Upper limit (95% CI)
Diseases of the respiratory system . . . . .	464,094	100.0	....	....	....	13,932,821	100.0	....	....	....
460-66 Acute respiratory infections . . . . .	236,980	51.1	0.1	50.9	51.3	7,029,592	50.5	1.7	47.1	53.8
460 Acute nasopharyngitis (common cold) . . . . .	1,867	0.4	0.0	0.4	0.4	107,391	0.8	0.4	0.2	2.2
461 Acute sinusitis . . . . .	10,122	2.2	0.0	2.2	2.2	217,616	1.6	0.4	0.9	2.5
462 Acute pharyngitis . . . . .	48,498	10.5	0.0	10.5	10.5	1,540,304	11.1	1.0	9.2	13.1
463 Acute tonsillitis . . . . .	6,191	1.3	0.0	1.3	1.3	374,568	2.7	0.8	1.3	4.8
464 Acute laryngitis and tracheitis <sup>2</sup> . . . . .	17,613	3.8	0.0	3.8	3.8	330,855	2.4	0.5	1.5	3.5
465 Acute upper respiratory infections of multiple or unspecified site . . . . .	106,412	22.9	0.1	22.7	23.1	3,222,206	23.1	1.8	19.6	27.0
466 Acute bronchitis and bronchiolitis . . . . .	46,277	10.0	0.0	10.0	10.0	1,236,652	8.9	1.2	6.6	11.6
470-78 Other diseases of upper respiratory tract <sup>2</sup> . . . . .	22,264	4.8	0.0	4.8	4.8	1,082,876	7.8	1.3	5.4	10.8
470 Deviated nasal septum . . . . .	31	0.0	0.0	0.0	0.0	1,065	0.0	0.0	0.0	0.2
471 Nasal polyps . . . . .	52	0.0	0.0	0.0	0.0	2,465	0.0	0.0	0.0	0.2
472 Chronic pharyngitis and nasopharyngitis . . . . .	377	0.1	0.0	0.1	0.1	10,863	0.1	0.1	0.0	0.3
473 Chronic sinusitis <sup>2</sup> . . . . .	8,397	1.8	0.0	1.8	1.8	587,755	4.2	0.7	2.9	5.9
474 Chronic disease of tonsils and adenoids . . . . .	343	0.1	0.0	0.1	0.1	13,703	0.1	0.1	0.0	0.5
475 Peritonsillar abscess . . . . .	1,966	0.4	0.0	0.4	0.4	44,312	0.3	0.1	0.1	0.7
477 Allergic rhinitis . . . . .	4,728	1.0	0.0	1.0	1.0	104,117	0.7	0.3	0.3	1.5
478 Other diseases of upper respiratory tract (includes 476, Chronic laryngitis) . . . . .	6,370	1.4	0.0	1.4	1.4	318,596	2.3	0.8	0.9	4.6
480-88 Pneumonia and influenza . . . . .	76,181	16.4	0.1	16.2	16.6	2,057,909	14.8	1.2	12.5	17.3
480-86 Pneumonia . . . . .	49,979	10.8	0.0	10.8	10.8	1,503,825	10.8	1.1	8.7	13.2
487-88 Influenza . . . . .	26,202	5.7	0.0	5.7	5.7	554,084	4.0	0.9	2.4	6.1
490-96 Chronic obstructive pulmonary disease and allied conditions . . . . .	128,669	27.8	0.1	27.6	28.0	3,762,444	27.0	1.6	23.9	30.3
490-91 Bronchitis . . . . .	41,857	9.0	0.0	9.0	9.0	1,476,560	10.6	1.3	8.2	13.4
492 Emphysema . . . . .	359	0.1	0.0	0.1	0.1	11,540	0.1	0.0	0.0	0.3
493 Asthma <sup>2</sup> . . . . .	83,382	18.0	0.1	17.8	18.2	2,024,408	14.5	1.2	12.3	17.0
494 Bronchiectasis . . . . .	385	0.1	0.0	0.1	0.1	0	...	...	...	...
495 Extrinsic allergic alveolitis . . . . .	45	0.0	0.0	0.0	0.0	0	...	...	...	...
496 Chronic airway obstruction, not elsewhere classified <sup>2</sup> . . . . .	2,641	0.6	0.0	0.6	0.6	249,936	1.8	0.4	1.1	2.9

... Category not applicable.

0.0 Quantity more than zero but less than 0.05.

<sup>1</sup>Based on the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM).

<sup>2</sup>NHCS percentage is statistically different from the NHAMCS percentage.

NOTES: ED is emergency department. CI is confidence interval. Numbers may not add to totals because of rounding.

SOURCES: National Center for Health Statistics, National Hospital Care Survey (NHCS) and National Hospital Ambulatory Medical Care Survey (NHAMCS), 2014.

**Table 3. Sex distribution of emergency department visits for patients with a respiratory illness listed as the primary diagnosis: National Hospital Care Survey, 2014, and National Hospital Ambulatory Medical Care Survey, 2014**

Sex	Unweighted (NHCS)				Weighted (NHAMCS)			
	Percent	Standard error	Lower limit (95% CI)	Upper limit (95% CI)	Percent	Standard error	Lower limit (95% CI)	Upper limit (95% CI)
Female . . . . .	53.5	0.1	53.3	53.7	54.8	1.5	51.7	57.9
Male . . . . .	46.5	0.1	46.3	46.7	45.2	1.5	42.1	48.3

NOTE: CI is confidence interval.

SOURCES: National Center for Health Statistics, National Hospital Care Survey (NHCS) and National Hospital Ambulatory Medical Care Survey (NHAMCS), 2014.



**Table 4. Age distribution, by sex of emergency department visits for patients with a respiratory illness listed as the primary diagnosis: National Hospital Care Survey, 2014, and National Hospital Ambulatory Medical Care Survey, 2014**

Sex and age	Unweighted (NHCS)				Weighted (NHAMCS)			
	Percent	Standard error	Lower limit (95% CI)	Upper limit (95% CI)	Percent	Standard error	Lower limit (95% CI)	Upper limit (95% CI)
<b>Total</b>								
Under 1 <sup>1</sup> .....	10.2	0.0	10.1	10.3	7.2	0.9	5.5	9.2
1–17 <sup>1</sup> .....	39.4	0.1	39.3	39.5	34.6	2.2	30.3	39.2
18–44 <sup>1</sup> .....	23.4	0.1	23.3	23.5	31.1	2.4	26.5	36.0
45–64 .....	15.0	0.1	14.9	15.1	16.0	1.8	12.5	20.0
65 and over. ....	12.0	0.0	11.9	12.1	11.0	1.1	8.9	13.5
<b>Female</b>								
Under 1 .....	8.2	0.0	8.1	8.3	6.7	1.1	4.7	9.2
1–17 .....	33.7	0.1	33.6	33.8	30.9	2.5	26.0	36.1
18–44 .....	28.3	0.1	28.2	28.4	33.3	2.7	27.9	39.0
45–64 .....	16.7	0.1	16.6	16.8	17.2	2.0	13.5	21.6
65 and over. ....	13.1	0.0	13.0	13.2	11.9	1.4	9.3	15.0
<b>Male</b>								
Under 1 <sup>1</sup> .....	12.4	0.0	12.3	12.5	7.9	1.4	5.3	11.2
1–17 <sup>1</sup> .....	46.1	0.1	46.0	46.2	39.2	2.7	33.7	44.8
18–44 <sup>1</sup> .....	17.8	0.1	17.7	17.9	28.5	2.5	23.6	33.8
45–64 .....	13.1	0.0	13.0	13.2	14.5	2.3	10.2	19.6
65 and over. ....	10.7	0.0	10.6	10.8	9.9	1.5	7.1	13.4

... Category not applicable.

0.0 Quantity more than zero but less than 0.05.

<sup>1</sup>NHCS percentage is statistically different from the NHAMCS percentage.

NOTES: CI is confidence interval. Totals may not add to 100 due to rounding.

SOURCES: National Center for Health Statistics, National Hospital Care Survey (NHCS) and National Hospital Ambulatory Medical Care Survey (NHAMCS), 2014.

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