

ORIGINAL RESEARCH

# National Estimates of Noncanine Bite and Sting Injuries Treated in US Hospital Emergency Departments, 2001–2010

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**Objective.**—Injuries resulting from contact with animals and insects are a significant public health concern. This study quantifies nonfatal bite and sting injuries by noncanine sources using data from the National Electronic Injury Surveillance System—All Injury Program (NEISS-AIP).

**Methods.**—The NEISS-AIP is an ongoing nationally representative surveillance system used to monitor all types and causes of injuries treated in US hospital emergency departments (EDs). Cases were coded by trained hospital coders using information from medical records on animal and insect sources of bite and sting injuries being treated. Data were weighted to produce national annualized estimates, percentages, and rates based on the US population.

**Results.**—From 2001 to 2010 an estimated 10.1 million people visited EDs for noncanine bite and sting injuries, based on an unweighted case count of 169,010. This translates to a rate of 340.1 per 100,000 people (95% CI, 232.9–447.3). Insects accounted for 67.5% (95% CI, 45.8–89.2) of bite and sting injuries, followed by arachnids 20.8% (95% CI, 13.8–27.9). The estimated number of ED visits for bedbug bite injuries increased more than 7-fold—from 2156 visits in 2007 to 15,945 visits in 2010.

**Conclusions.**—This study provides an update of national estimates of noncanine bite and sting injuries and describes the diversity of animal exposures based on a national sample of EDs. Treatment of nonfatal bite and sting injuries are costly to society. Direct medical and work time lost translates to an estimated \$7.5 billion annually.

*Key words:* insect, wasps, hornet, bee, ant, arachnid, reptile, snake, stings, bites, emergency

## Introduction

Despite numerous recommendations from both the medical and veterinary professions, injuries resulting from contact with animals remain a significant public health concern.<sup>1–3</sup> Animals can bite, sting, scratch, peck, maul, trample, fall on, throw off riders, crush, or gore. Even excluding infections and allergies resulting from exposure to animals, millions of individuals still suffer injuries from adverse encounters with animals in the United States resulting in pain, tissue damage, disability,

and even death. Although canine injuries have probably been the best documented, with an estimated 4 million persons reporting injuries per year, numerous other species cause human injury.<sup>4</sup>

Nonfatal bites and stings account for a substantial proportion of injuries from contact with animals. There have been a few national studies on the occurrence of nonfatal animal bites, primarily canine.<sup>4–6</sup> A recent study found an average of 323,000 dog bites treated in US hospital emergency departments (EDs) from 2005 to 2009,<sup>7</sup> and another national study from 2001 to 2006 found that dogs and cats were responsible for an annual average of 86,629 nonfatal falls.<sup>8</sup> The American Association of Poison Control Centers reports on calls regarding animal exposures, and in a study from 2001 to 2005, an annual average of 94,552 calls were made to poison control centers for animal exposures.<sup>9</sup>

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Additionally, there have been national studies on deaths from animal injuries. In recent reviews of US deaths from animal encounters, an average of 177 deaths per year were reported from animal encounters from 1991 to 2001, which increased slightly to 200 average annual deaths during the period 1999 to 2008.<sup>10,11</sup>

A few national studies have focused on noncanine bite and sting injury-related ED visits or hospitalizations. In a study using the Agency for Healthcare Research and Quality data on nationwide ED visits and community hospital discharges from 2006 to 2008, an annual average of 1 million ED visits and nearly 50,000 hospitalizations were reported.<sup>12</sup> That study, however, lacked detailed information on the type of animal species involved in the encounter. In comparison, O'Neil et al<sup>13</sup> provided much more detailed epidemiologic information on the species of noncanine animal bites and stings resulting in a visit to the ED. Based on their study, with data from 2001 to 2004, an estimated 900,000 people were treated in US hospital EDs annually for noncanine bite and sting injuries.<sup>13</sup> The current study provides an update to the work of O'Neil et al using more current data from the National Electronic Injury Surveillance System–All Injury Program (NEISS-AIP).

## Methods

### STUDY DESIGN AND SETTING

The National Electronic Injury Surveillance System (NEISS) is an ongoing surveillance system used to monitor consumer product–related injuries treated in US hospital EDs. The system is maintained and operated by the US Consumer Product Safety Commission (CPSC). There are currently 99 NEISS hospital EDs, which represent a stratified probability sample of all US and US territory hospitals that have at least 6 beds and provide 24-hour emergency services. The sample includes 5 strata, including 4 strata based on size (very large, large, medium, and small defined by the number of hospital ED visits annually) and 1 stratum for children's hospitals. The NEISS collects data only on the initial ED visit for an injury incident and is particularly sensitive for detecting emerging injury problems. The NEISS-AIP collects data from a nationally representative subsample of 66 NEISS hospitals. The NEISS-AIP tracks all types and causes of nonfatal injuries seen in EDs whether or not they are associated with consumer products. For this project, NEISS-AIP data were analyzed for a 10-year period from 2001 through 2010. The NEISS-AIP is a collaborative effort of the Centers for Disease Control and Prevention's (CDC's) National Center for Injury Prevention and Control (Injury Center) and the CPSC,

and has been described in more detail in previously published reports.<sup>13,14</sup>

For each case, NEISS hospital coders collected the following information from the ED medical record: age, sex, injury diagnosis, body part injured, ED discharge disposition, locale where the injury occurred (eg, home, street/highway), work-relatedness, and intentionality (ie, unintentional, assault, suicide attempt, or unknown intent) of the injury event. In addition, a 2-line narrative describing circumstance and treatment of injuries was recorded based on text in the medical record. For this study, cases were defined as people treated at an NEISS-AIP hospital for a bite or sting injury and were included if intent was coded as unintentional. Those who were dead on arrival or who died in the ED were excluded because these deaths are not fully captured by the NEISS-AIP. Dog and human bites and bites or stings incurred at work or during active military duty were excluded from these analyses. Dog bites have been addressed in other recent reports.<sup>15</sup> Human bites were excluded because most were assault-related. Work-related bites and stings were excluded because risk, exposure, and prevention are different from that of the general population and would most likely involve on-the-job safety precautions.

The ED discharge disposition included 6 possible categories: treated and released, transferred to another facility for specialized care (eg, trauma center), hospitalized, observed (ie, held for observation), left without being seen, or unknown. Given the small number of cases in the latter 3 categories, they were combined in the analyses. Cases that were transferred were combined with cases that were hospitalized in the NEISS-AIP and are referred to in the text as hospitalized.

### CLASSIFICATION OF STUDY CASES BY SOURCE

Cases were initially classified hierarchically by broader species categories and for specific types of species, using computer programs to conduct keyword searches (including misspellings) of the narrative for each NEISS-AIP case. The initial assignment along with the narrative description for each nonfatal bite and sting case was then visually reviewed independently by 2 study researchers to confirm the accuracy of classification. Discrepancies in classification of NEISS-AIP cases among reviewers were then resolved by discussion and consensus.

### DATA ANALYSIS

National annual estimates and percentages were based on weighted data. A sample weight was calculated by the CPSC for each injured person treated at an NEISS-AIP

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