TAKING A BITE OUT OF CLAIMS DATA TO PROVIDE INSIGHTS INTO RARE EVENTS: A DESCRIPTIVE ANALYSIS OF SHARK, PIG, AND RACCOON BITE PATIENTS IN THE U.S.
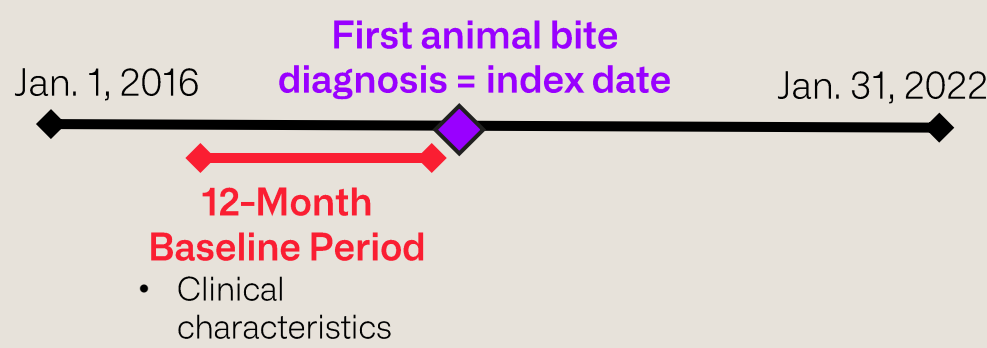
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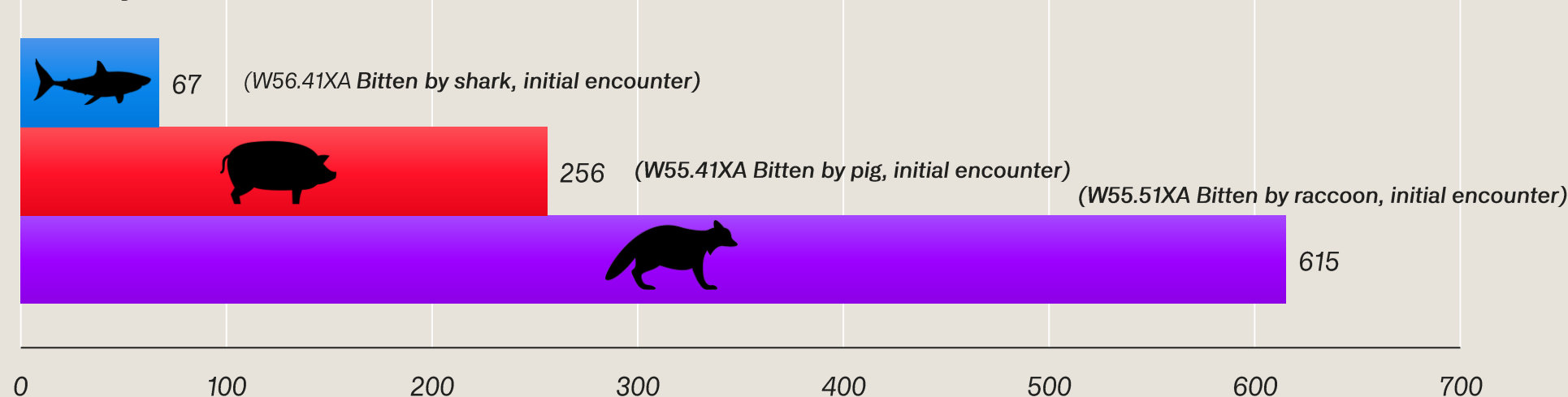
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Study Summary

Study Question: How likely are rare event diagnosis codes, such as codes for shark, pig and raccoon bites, to be captured in large U.S. administrative claims databases?

Study Design:

Jan. 1, 2016 — First animal bite diagnosis = index date — Jan. 31, 2022

12-Month Baseline Period
- Clinical characteristics

Study Results: _Number of patients with a shark, pig, or raccoon bite claim_

67 _(W56.41XA Bitten by shark, initial encounter)_
256 _(W55.41XA Bitten by pig, initial encounter)_
615 _(W55.51XA Bitten by raccoon, initial encounter)_

(axis: 0, 100, 200, 300, 400, 500, 600, 700)

Conclusion: Given the large proportion of the U.S. population included in the Merative® MarketScan Commercial and Medicare Databases, even patients with rare ICD-10 diagnosis codes can be identified. Also, if you follow the real-world data, raccoons may be scarier than sharks!

Background
- Identifying rare diseases and outcomes in administrative claims data can be limited by the existence of specific International Classification of Diseases (ICD) diagnosis codes and overall sample size of the database.[1]
- Although these animal bite codes were analyzed for demonstrative purposes, it is important to acknowledge that healthcare utilization and clinical outcomes of such events can be quite burdensome, even in the case of bites from smaller or domesticated animals which may require a visit to the emergency department or follow-up care for infections or transmitted diseases such as rabies.[2]

Objective
- We aimed to assess the ability to identify rare animal bite events via a large, claims database via ICD-10 diagnosis codes.

Methods
Study Design and Data Source
- This study employed a retrospective observational cohort design within the Merative™ MarketScan® Commercial Claims and Encounters Database and Medicare Database.
- The MarketScan data was accessed using Treatment Pathways 4.0, an online analytic platform, to identify patients via ICD-10 codes for the various animal bites:
  - Shark: W56.41XA: bitten by shark, initial encounter
  - Pig: W55.41XA: bitten by pig, initial encounter
  - Raccoon: W55.51XA: bitten by raccoon, initial encounter

Outcomes
- Patient demographics were measured at the index date (i.e., the date of the first claim with a diagnosis for the bite).
- Bite location was assessed via injury location ICD-10 diagnosis codes on the index date (most common location codes listed in Table 1).
- Baseline clinical characteristics were measured in the 12 months prior to the index date among the subset of patients with continuous enrollment in the database throughout the 12-month baseline period.

Results: Study Cohorts
- In the Merative MarketScan Commercial and Medicare Databases, we identified 67 patients with a shark bite claim, 256 patients for pig bites, and 615 for raccoon bites (Figure 1).

Figure 1. Patient Selection

Enrollees in the MarketScan Commercial and Medicare Databases with at least one day of enrollment in medical and pharmacy benefits during the study time period of 1/1/16 through 1/31/2022
N=59,789,062

Patients with ≥1 claim with a diagnosis code for a **shark bite** during the study period N=67 (i.e., 1 in a million)	Patients with ≥1 claim with a diagnosis code for a **pig bite** during the study period N=256 (i.e., 4 in a million)	Patients with ≥1 claim with a diagnosis code for a **raccoon bite** during the study period N=615 (i.e., 10 in a million)

Subsets for measuring baseline clinical characteristics:

Patients with ≥12 months of continuous enrollment prior to the bite claim N=55	Patients with ≥12 months of continuous enrollment prior to the bite claim N=187	Patients with ≥12 months of continuous enrollment prior to the bite claim N=454

Results: Cohort Characteristics
- Shark bite patients were predominantly male (79%) and the mean age was 31.6 years (Table 1).
- Most common bite locations were on right extremities across all cohorts.
- The baseline Deyo-Charlson Comorbidity Index scores were low among all cohorts, indicating a low overall comorbidity burden (Table 1).

Table 1. Patient Characteristics

	Shark bite N=67	Pig Bite N=256	Raccoon Bite N=615
Age, mean years (SD)	31.6 (17.7)	34.5 (19.6)	42.7 (19.5)
Age group, N (%)			
<18	22 (33%)	66 (26%)	66 (11%)
18-24	6 (9%)	25 (10%)	79 (13%)
25-34	11 (16%)	37 (14%)	88 (14%)
35-44	10 (15%)	35 (14%)	80 (13%)
45-54	7 (10%)	50 (20%)	105 (17%)
55-64	10 (15%)	35 (14%)	131 (21%)
65+	1 (1%)	8 (3%)	66 (11%)
Male, N (%)	53 (79%)	95 (37%)	307 (50%)
Most common bite location, ICD-10 code, N (%)	S81.851A: right lower leg 11 (16%)	S61.451A: right hand 19 (7%)	S61.451A: right hand 62 (10%)
2nd most common	S91.351A: right foot 5 (7%)	S61.250A: right index finger 15 (6%)	S61.250A: right index finger 57 (9%)
3rd most common	S91.352A: left foot 4 (6%)	S81.852A: left lower leg 14 (5%)	S61.452A: left hand 51 (8%)
Subset with 12 months of baseline continuous enrollment:			
	N=55	N=187	N=454
Deyo-Charlson Comorbidity Index Score, mean (SD)	0.42 (1.4)	0.35 (0.8)	0.47 (1.1)
Deyo-Charlson Comorbidities, N (%):			
Chronic obstructive pulmonary disease	7 (13%)	20 (11%)	49 (11%)
Diabetes (without complications)	3 (5%)	12 (6%)	39 (9%)
Cerebrovascular disease	2 (4%)	0 (0%)	9 (2%)
Cancer	1 (2%)	7 (4%)	18 (4%)

SD, standard deviation; Comorbidities selected with the highest frequency among the cohorts (others were <3% across all cohorts)

Limitations
- This analysis has conventional limitations of claims-based analyses.
- Diagnoses on claims may be mis-coded, thereby potentially underestimating the size of the patient populations.
- Bites that do not result in medical claims would not be captured in this claims data source; therefore, less severe bites, which may be more common for smaller animals, may be underreported.

Conclusions
- Whether your research is about animal bites or about a rare disease, these findings demonstrate the utility of large databases to analyze rare diagnosis codes.
- The value of strong real-world data with high patient volume, coupled with highly specific ICD-10 codes, can fuel research, policy and treatment insights.

References
1. Dicken, John E. Rare Diseases : Although Limited, Available Evidence Suggests Medical and Other Costs Can Be Substantial : Report to Congressional Committees. [Washington, D.C.]: United States Government Accountability Office, 2021.
2. Ma, Xiaoyue et al. "Rabies surveillance in the United States during 2020." Journal of the American Veterinary Medical Association, 1–9. 5 May. 2022, doi:10.2460/javma.22.03.0112

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