Research design & study execution workshop series

Session 6

SEPTEMBER 16, 2015

Quick review of Sessions 1-5

- How to identify a “good” research question
- Common study designs: Pros & cons
- Selecting appropriate study subjects
- Understanding variables types and their measurement

Case study: Football-related injuries

Nuts and bolts of good data management: Part I

Data collection & data entry

If you have…

1. Identified a research question
2. Conducted a literature review
3. Picked an appropriate study design
4. Defined inclusion/exclusion criteria for subjects
5. Considered predictor and outcome variables

Next step: Work on creating a “smart” data collection system

Data management process

All of the steps required to create a clean data set ready to be analyzed

Three keys to success

1. Clarity
2. Consistency
3. Documentation

Concrete products

1. Dummy tables and figures for publication
2. Data collection instruments
3. Data entry forms (Excel files, etc.)
4. Data codebook/coding manuals
5. Study manual

Overview of the process

1. Collect the data
2. Enter the data
3. Combine and clean data files
4. Recode, transform and derive new variables
5. Document and archive raw data sets

Step 1. Data collection Methods

- Download existing data and use as is
- Extract information from existing medical records
- Conduct a survey (online, phone, mail, in person)
- Collect raw data from direct observations, etc.

Each has pros & cons

Step 1. Data collection Format

- Paper/pen
- Mobile devices (phones, tablets, etc.)
- Stationary computers

Each has pros & cons

Best practices

- Collect as little as possible
- Collect raw data
- Automate as much as possible
- Document the process

Step 2. Data entry
Goals

1. Convert the information to electronic format
2. Maintain accuracy & integrity of the information
3. Prevent as many errors as possible up-front

Step 2. Data entry
Methods & tools

1. Excel spreadsheet vs. data entry programs
2. Single vs. double data entry, one person or more?
3. Include logic checks & range checks
4. Define missing values, etc.

Best practices & “how-to” demo in Excel coming

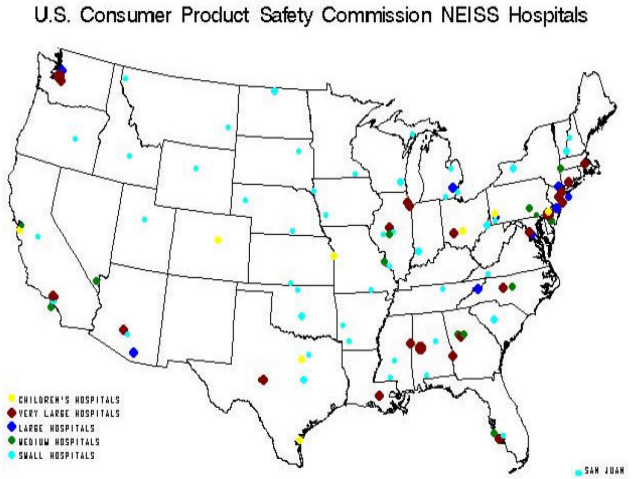
Published example: NEISS

Home / Research & Statistics

National Electronic Injury Surveillance System (NEISS)

CPSC's National Electronic Injury Surveillance System (NEISS) is a national probability sample of hospitals in the U.S. and its territories. Patient information is collected from each NEISS hospital for every emergency visit involving an injury associated with consumer products. From this sample, the total number of product-related injuries treated in hospital emergency rooms nationwide can be estimated. This web access to NEISS allows certain estimates to be retrieved on-line. These estimates can be focused by setting some or all of the following variables (and an example of each):

- Date (one year maximum range; e.g., how many injuries were treated in 1996)
- Product (e.g., how many bicycle injuries occurred)
- Sex (e.g., how many injuries occurred to women)
- Age (e.g., how many injuries occurred to people aged 35-55)
- Diagnosis (e.g., how many lacerations occurred)
- Disposition (e.g., how many people were admitted to the hospital)
- Locale (e.g., how many injuries occurred at a school)
- Body part (e.g., how many injuries involved the knee)



NEISS Coding Manual

January 2015

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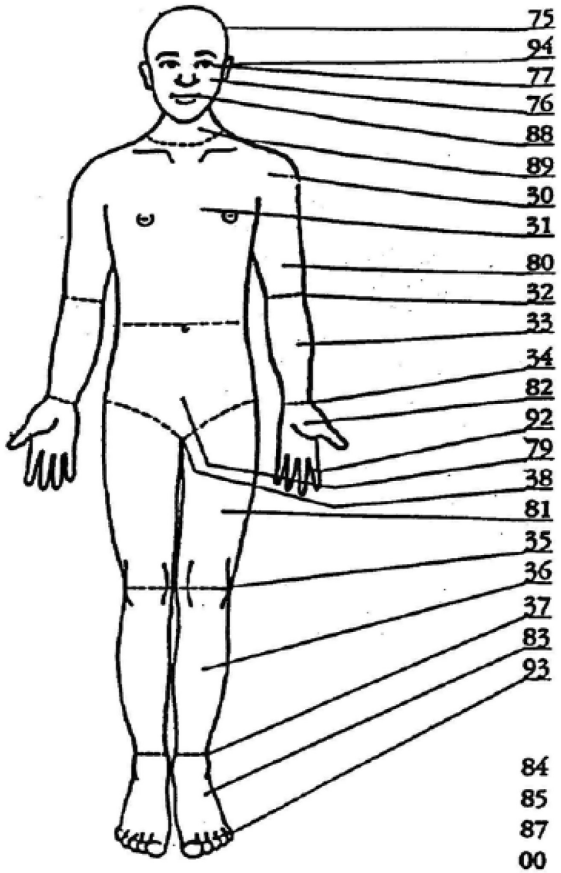
Appendix D: NEISS Body Part Diagram



CODE	BODY PART
75	Head
94	Ear
77	Eyeball
76	Face (including eyelid, eye area, nose, and forehead)
88	Mouth (including lips, tongue and teeth)
89	Neck
30	Shoulder
31	Upper trunk (not including shoulders)
80	Upper arm
32	Elbow
33	Lower Arm (not including elbow or wrist)
34	Wrist
82	Hand
92	Finger
79	Lower trunk
38	Pubic region
81	Upper leg
35	Knee
36	Lower leg (not including knee or ankle)
37	Ankle
83	Foot
93	Toe
84	25-50% of Body
85	All Parts of Body
87	Not Stated
00	Internal

Appendix E: Summary of Other Codes

Age
Code in months (preceded by the number 2) if patient is less than 2 years old. Code in years if patient is 2 years old or more.

201 = less than 8 weeks
206 = 6 months
218 = 18 months
002 = 2 years
022 = 22 years
045 = 45 years
078 = 78 years
102 = 102 years
000 = not recorded

Greater than 115 years, see guidance in introduction section of coding manual.

Gender
1 = Male
2 = Female
0 = Not recorded

Injury Diagnosis
See Appendices B and D

Body Part Affected
See Appendices C and D

Disposition
1 = Treated and released or examined and released without treatment
2 = Treated and transferred to another hospital
4 = Treated and admitted for hospitalization (within same facility)
5 = Held for observation
6 = Left without being seen/Left against medical advice (AMA)
8 = Fatality, including DOA, died in the ED, brain dead
9 = Not recorded

Product Codes
See alphabetic product code list.

Injury Intent
1 = Assault / intentional injury inflicted by one person on another person
2 = Self-inflicted injury (confirmed or suspected)
3 = Injury related to legal intervention / law enforcement activities
0 = Unintentional (accidental) injury or injury intent not determined / not recorded

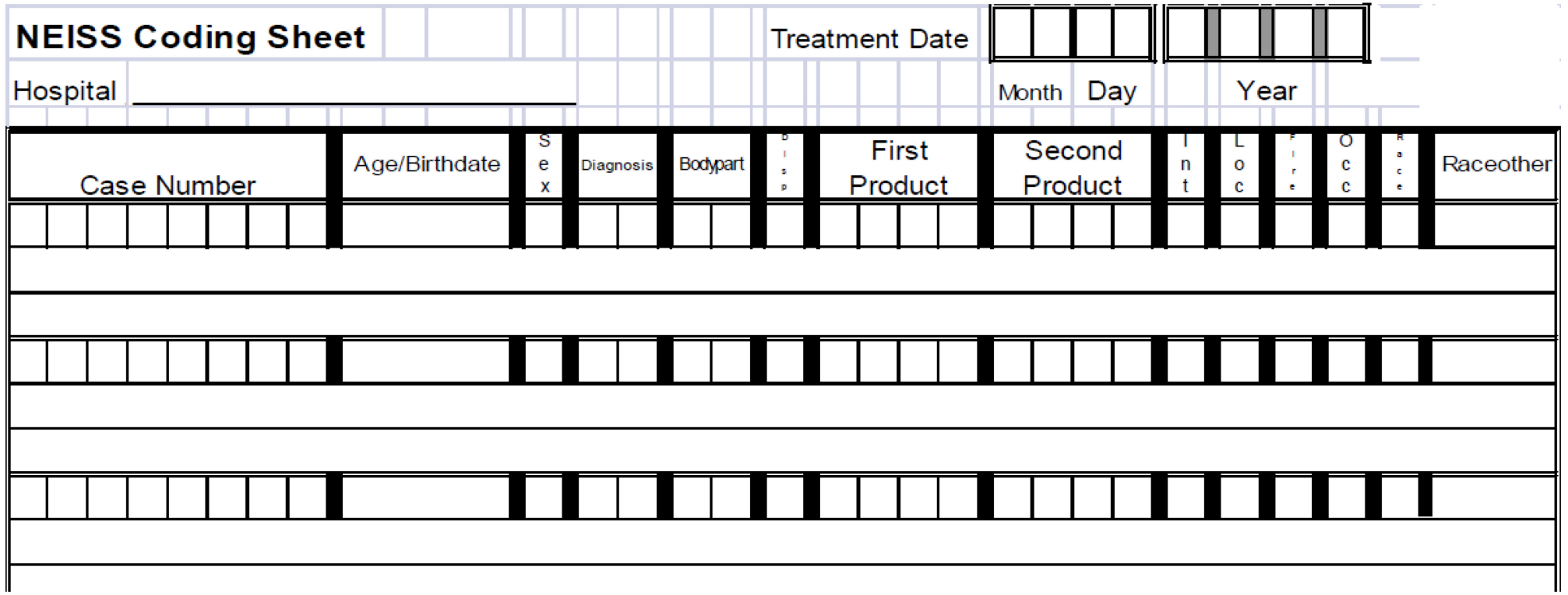
Locale of Accident
1 = Home
2 = Farm/ranch
4 = Street or highway
5 = Other public property
6 = Mobile/Manufactured home
7 = Industrial
8 = School/Daycare
9 = Place of recreation or sports
0 = Not recorded

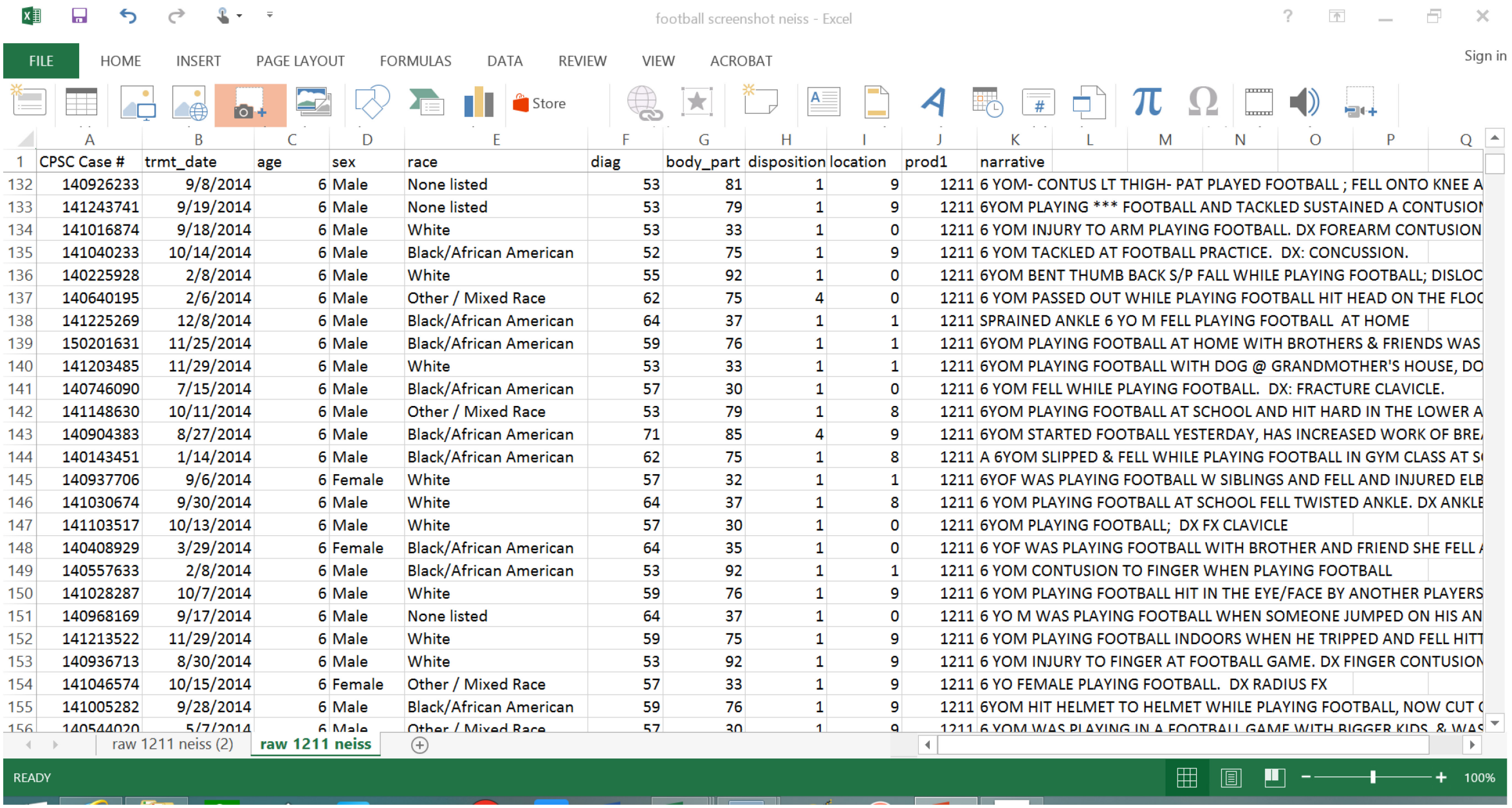
Fire Involvement
1 = Fire involvement and/or smoke inhalation - Fire Dept. attended
2 = Fire involvement and/or smoke inhalation - Fire Dept. did not attend
3 = Fire involvement and/or smoke inhalation - Fire Dept. attendance is not recorded
0 = No fire involvement or fire involvement not recorded

Occupational or Work-related
1 = Work-related; occurred on the job (excluding active military duty)
2 = Not work-related; did not occur on the job
3 = Work-related; active military duty
0 = Not recorded

Race
1 = White
2 = Black/African American
4 = Asian
5 = American Indian/Alaska Native
6 = Native Hawaiian/Pacific Islander
3 = Other
0 = Not stated in ER record

Appendix A: NEISS Coding Sheet





	A	B	C	D	E	F	G	H	I	J	K
1	CPSC Case #	trmt_date	age	sex	race	diag	body_part	disposition	location	prod1	narrative
132	140926233	9/8/2014	6	Male	None listed	53	81	1	9	1211	6 YOM- CONTUS LT THIGH- PAT PLAYED FOOTBALL ; FELL ONTO KNEE A
133	141243741	9/19/2014	6	Male	None listed	53	79	1	9	1211	6YOM PLAYING *** FOOTBALL AND TACKLED SUSTAINED A CONTUSION
134	141016874	9/18/2014	6	Male	White	53	33	1	0	1211	6 YOM INJURY TO ARM PLAYING FOOTBALL. DX FOREARM CONTUSION
135	141040233	10/14/2014	6	Male	Black/African American	52	75	1	9	1211	6 YOM TACKLED AT FOOTBALL PRACTICE. DX: CONCUSSION.
136	140225928	2/8/2014	6	Male	White	55	92	1	0	1211	6YOM BENT THUMB BACK S/P FALL WHILE PLAYING FOOTBALL; DISLOC
137	140640195	2/6/2014	6	Male	Other / Mixed Race	62	75	4	0	1211	6 YOM PASSED OUT WHILE PLAYING FOOTBALL HIT HEAD ON THE FLOC
138	141225269	12/8/2014	6	Male	Black/African American	64	37	1	1	1211	SPRAINED ANKLE 6 YO M FELL PLAYING FOOTBALL AT HOME
139	150201631	11/25/2014	6	Male	Black/African American	59	76	1	1	1211	6YOM PLAYING FOOTBALL AT HOME WITH BROTHERS & FRIENDS WAS
140	141203485	11/29/2014	6	Male	White	53	33	1	1	1211	6YOM PLAYING FOOTBALL WITH DOG @ GRANDMOTHER'S HOUSE, DO
141	140746090	7/15/2014	6	Male	Black/African American	57	30	1	0	1211	6 YOM FELL WHILE PLAYING FOOTBALL. DX: FRACTURE CLAVICLE.
142	141148630	10/11/2014	6	Male	Other / Mixed Race	53	79	1	8	1211	6YOM PLAYING FOOTBALL AT SCHOOL AND HIT HARD IN THE LOWER A
143	140904383	8/27/2014	6	Male	Black/African American	71	85	4	9	1211	6YOM STARTED FOOTBALL YESTERDAY, HAS INCREASED WORK OF BRE
144	140143451	1/14/2014	6	Male	Black/African American	62	75	1	8	1211	A 6YOM SLIPPED & FELL WHILE PLAYING FOOTBALL IN GYM CLASS AT S
145	140937706	9/6/2014	6	Female	White	57	32	1	1	1211	6YOF WAS PLAYING FOOTBALL W SIBLINGS AND FELL AND INJURED ELB
146	141030674	9/30/2014	6	Male	White	64	37	1	8	1211	6 YOM PLAYING FOOTBALL AT SCHOOL FELL TWISTED ANKLE. DX ANKLE
147	141103517	10/13/2014	6	Male	White	57	30	1	0	1211	6YOM PLAYING FOOTBALL; DX FX CLAVICLE
148	140408929	3/29/2014	6	Female	Black/African American	64	35	1	0	1211	6 YOF WAS PLAYING FOOTBALL WITH BROTHER AND FRIEND SHE FELL A
149	140557633	2/8/2014	6	Male	Black/African American	53	92	1	1	1211	6 YOM CONTUSION TO FINGER WHEN PLAYING FOOTBALL
150	141028287	10/7/2014	6	Male	White	59	76	1	9	1211	6 YOM PLAYING FOOTBALL HIT IN THE EYE/FACE BY ANOTHER PLAYERS
151	140968169	9/17/2014	6	Male	None listed	64	37	1	0	1211	6 YO M WAS PLAYING FOOTBALL WHEN SOMEONE JUMPED ON HIS AN
152	141213522	11/29/2014	6	Male	White	59	75	1	9	1211	6 YOM PLAYING FOOTBALL INDOORS WHEN HE TRIPPED AND FELL HITT
153	140936713	8/30/2014	6	Male	White	53	92	1	9	1211	6 YOM INJURY TO FINGER AT FOOTBALL GAME. DX FINGER CONTUSION
154	141046574	10/15/2014	6	Female	Other / Mixed Race	57	33	1	9	1211	6 YO FEMALE PLAYING FOOTBALL. DX RADIUS FX
155	141005282	9/28/2014	6	Male	Black/African American	59	76	1	9	1211	6YOM HIT HELMET TO HELMET WHILE PLAYING FOOTBALL, NOW CUT C
156	140544020	5/7/2014	6	Male	Other / Mixed Race	57	30	1	9	1211	6 YOM WAS PLAYING IN A FOOTBALL GAME WITH BIGGER KIDS & WAS

Working example: Montage

Football-related injuries requiring radiologic imaging among 6- to 17-year olds treated in the emergency department of a children's hospital: 2013-2014

Unsettled issue: Conflicting claims about the frequency of severe football-related injuries among very young football players (6-11 years old)

Research question: Is age associated with the type or severity of football-related injuries among 6-17 year old males who visited the emergency room?

Null hypothesis: There is no association between age and the type or severity of football-related injuries

Subject selection

Inclusion criteria	**N**
All exams completed Jan 1, 2000 through Dec 31, 2014 that had “football” mentioned anywhere in the report text	**4766**
Exclusion criteria	4159
Exams done outside Children’s DC location	120
All females	158
Patients outside the 6-17 year old age range	153
Patient status not clearly classified (all years prior to 2013)	3516
Inpatients and outpatients	212
Final sample size (# of exams in emergency patients)	**607**

Dummy tables and figures

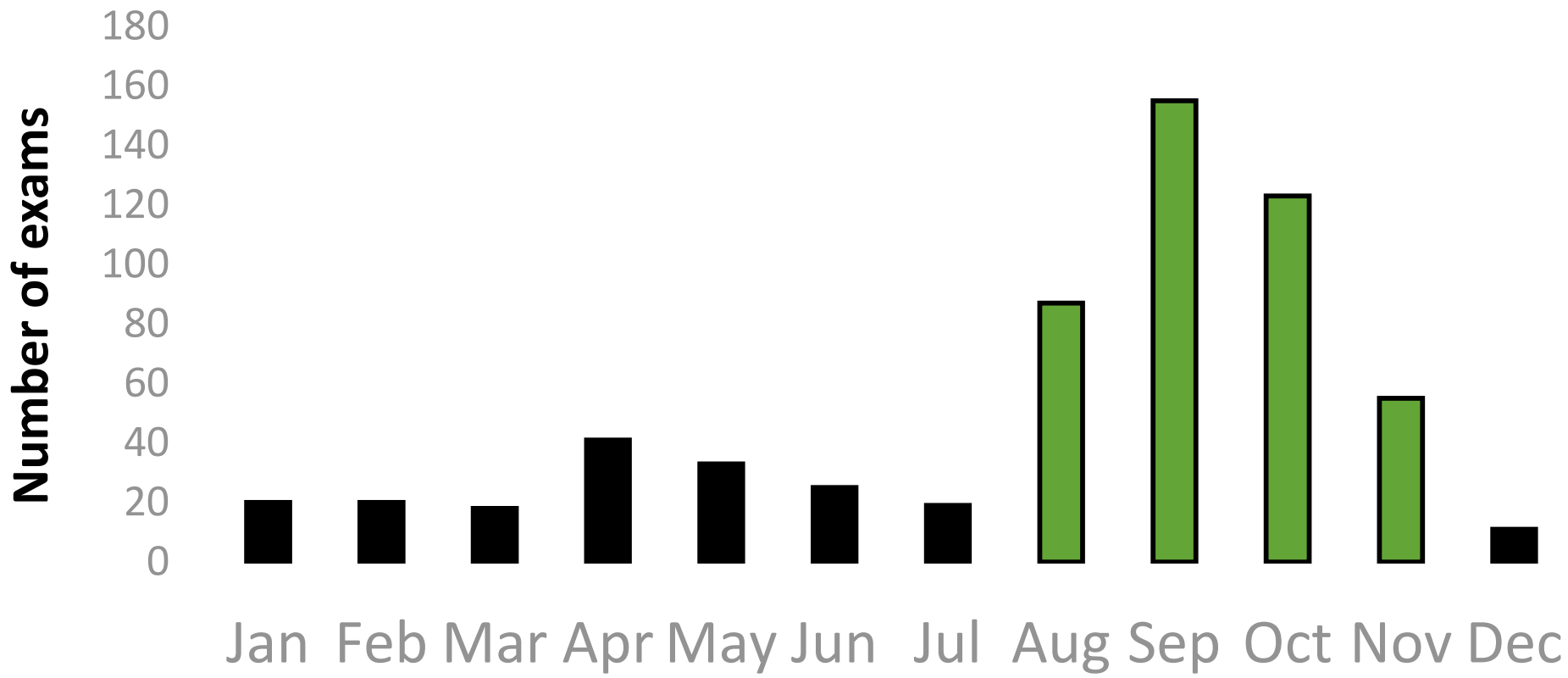
Characteristics of study population

Characteristic	N	%
Total number of exams	607	
Year of exam		
2013	269	44%
2014	338	56%
Total number of unique patients	463	
Age of patients (all exams)		
6-11 years	185	30%
12-17 years	422	70%

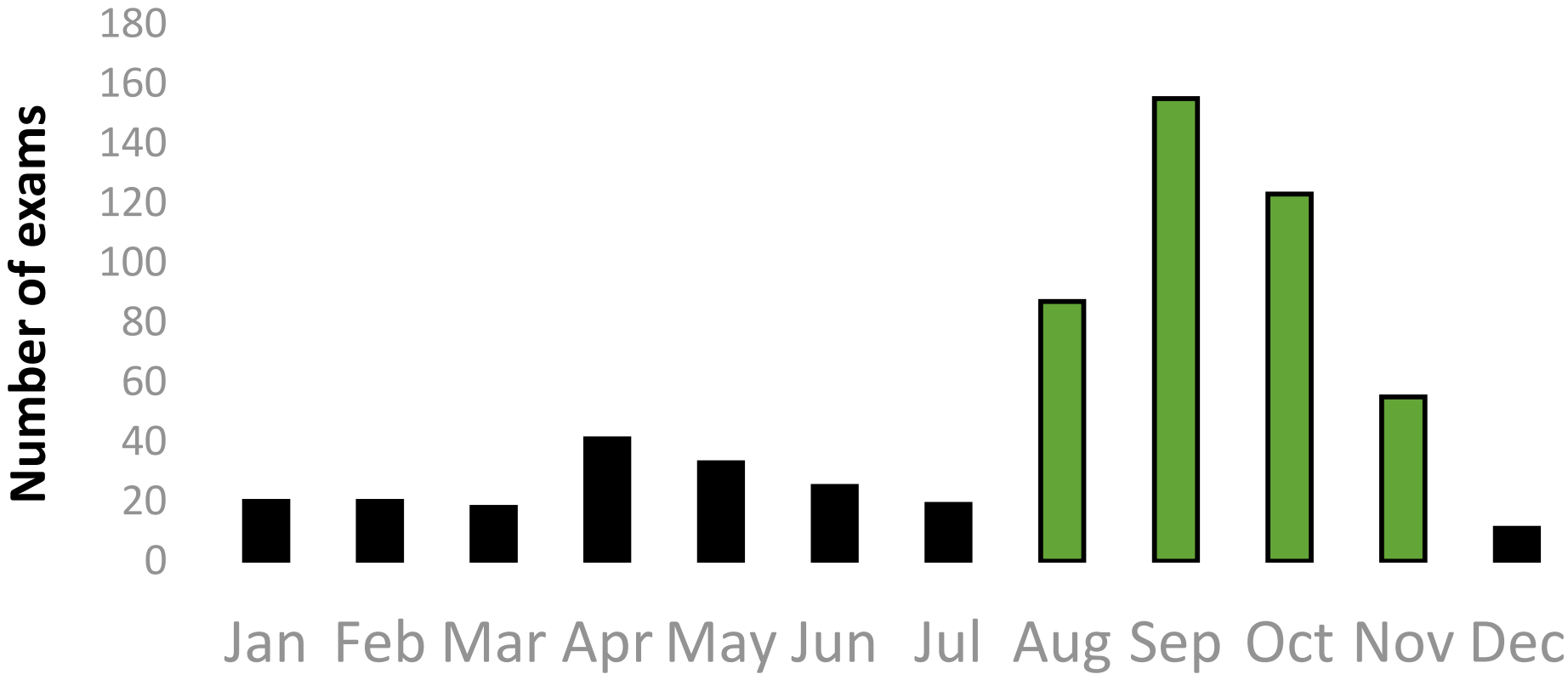
Characteristics of study population, cont.

Characteristic	N	%
Region of body part injured		
Lower extremity	305	50%
Upper extremity	200	33%
Trunk	62	10%
Head, neck & face	39	6%
Severity of injury		
Mild		
Severe		

Number of exams by month



Number of exams by month



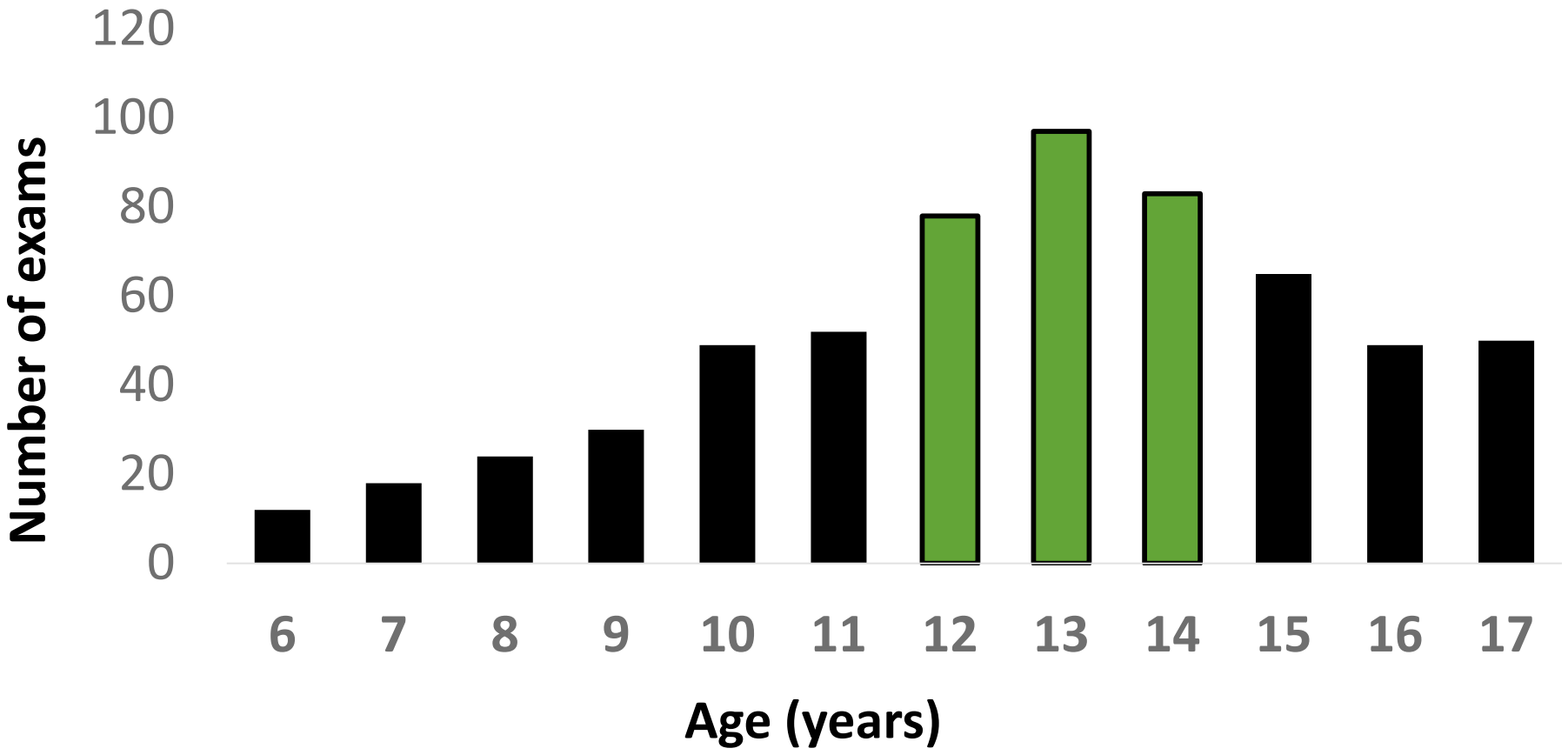
Numerical

Discrete (Limited number of quantifiable intervals)

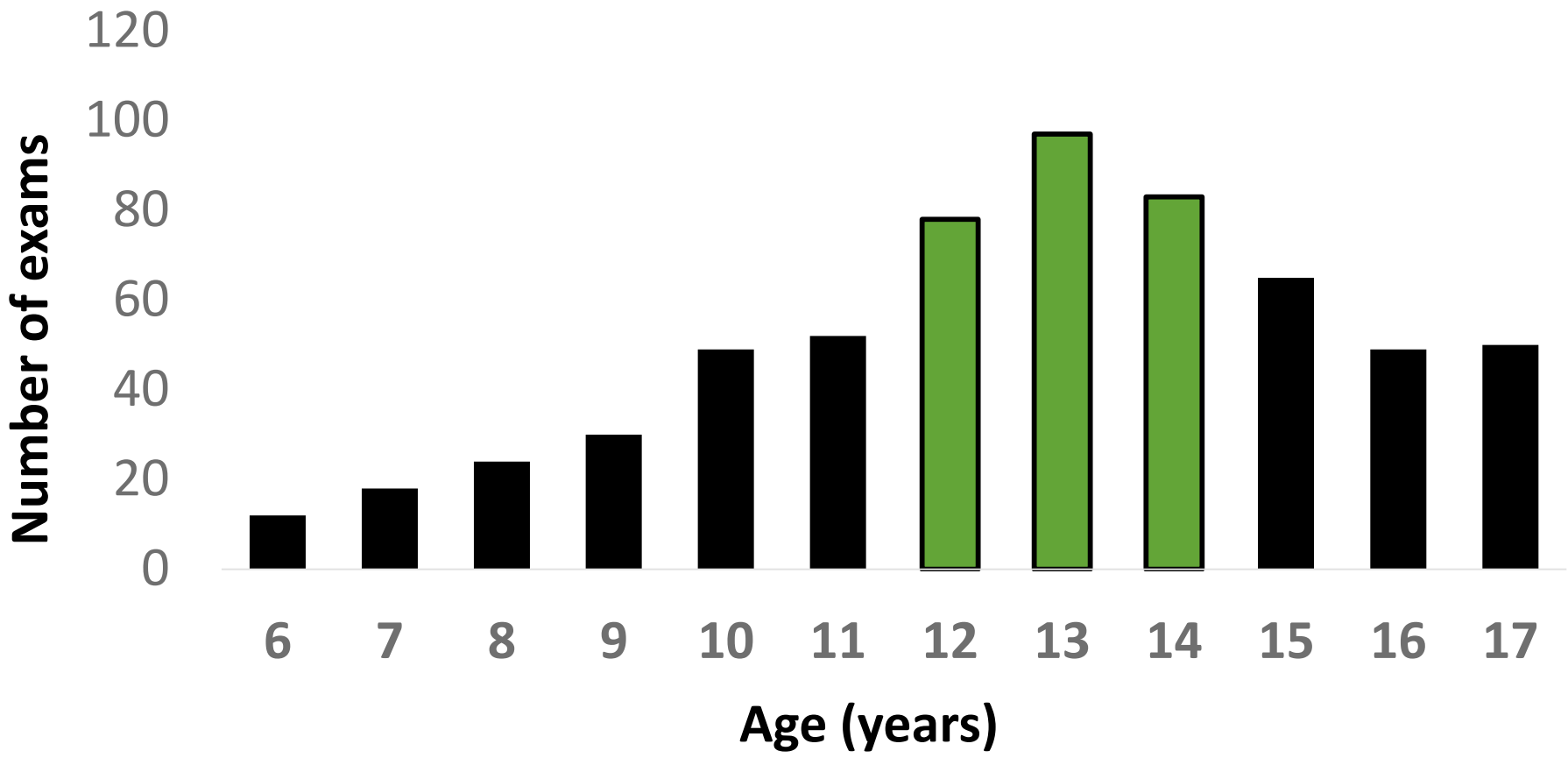
Categorical

Ordinal (Ordered categories)

Number of exams by age



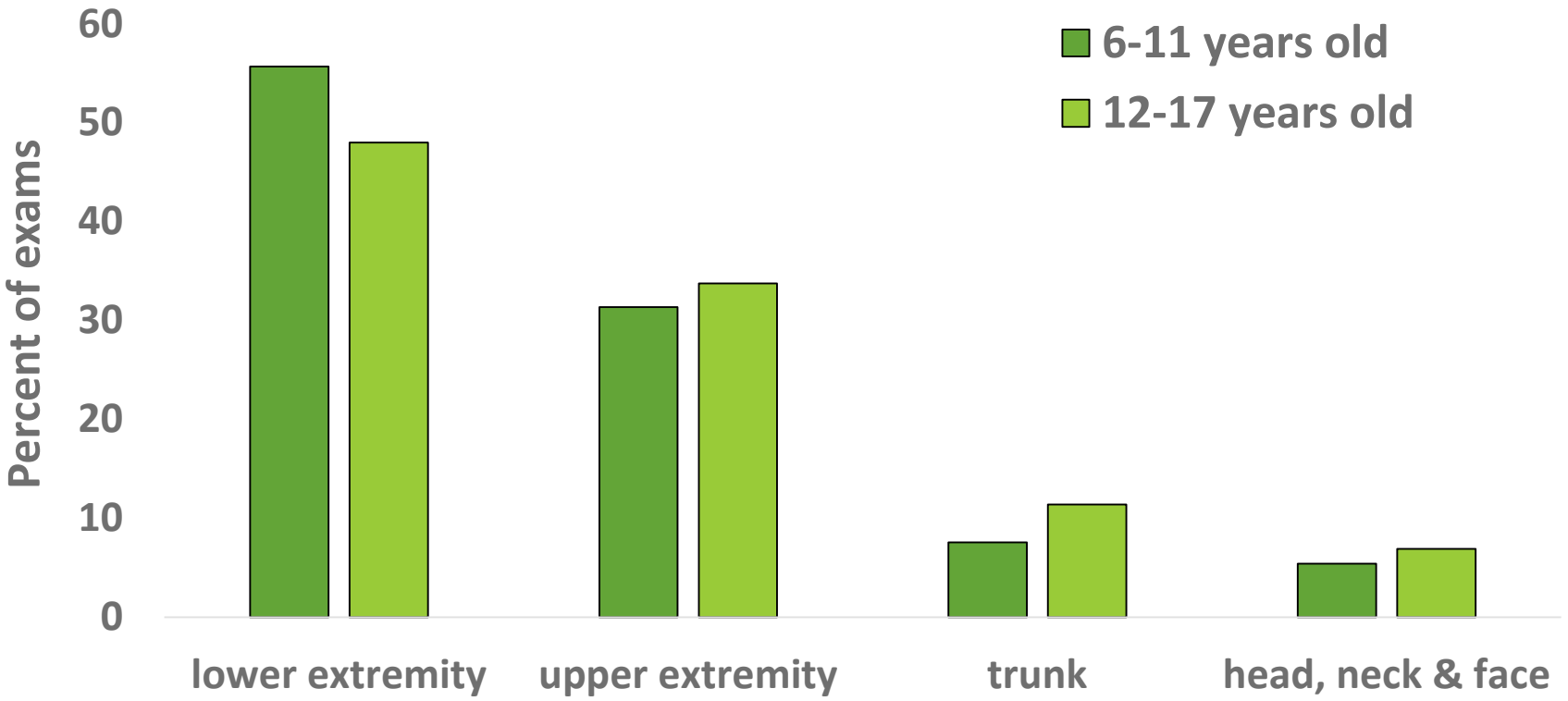
Number of exams by age



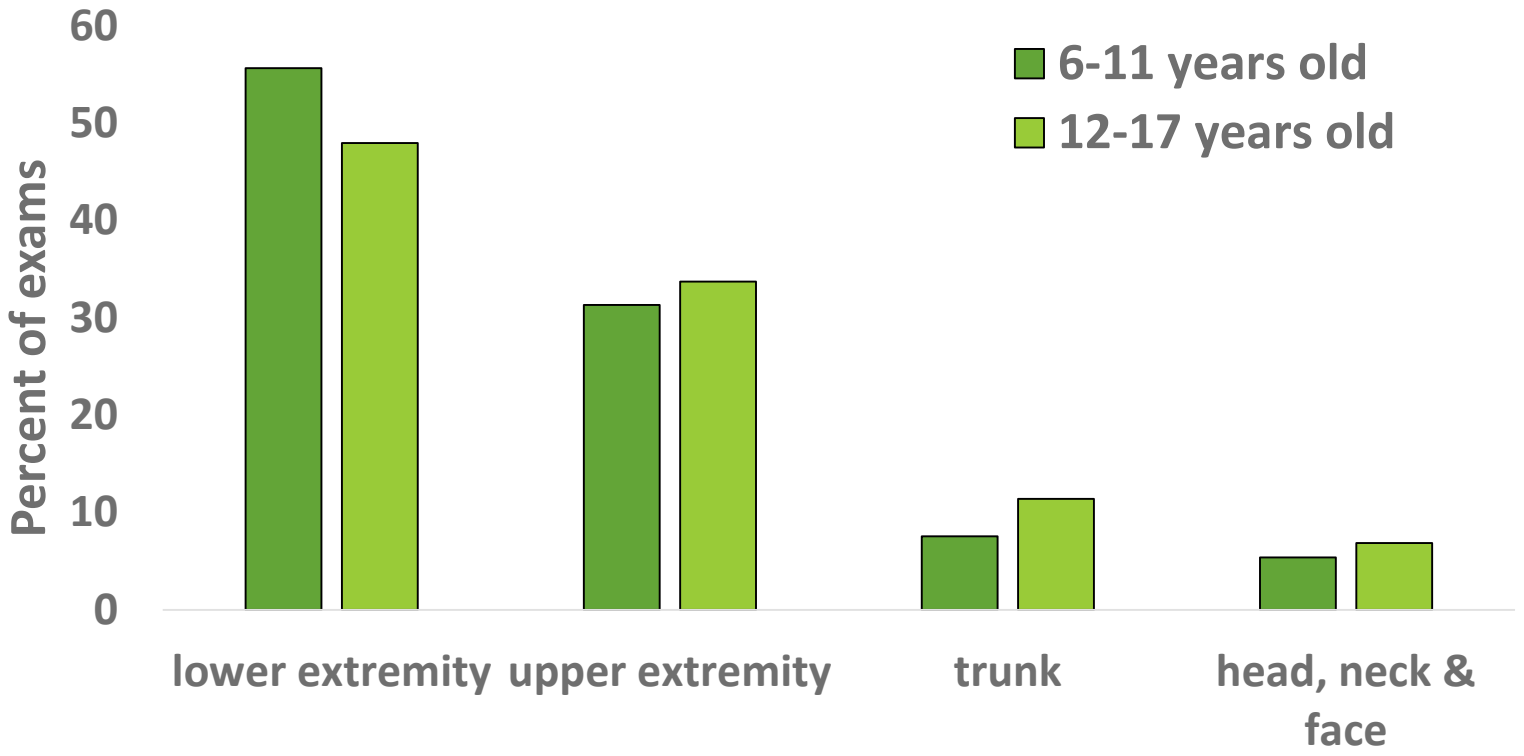
Numerical
Discrete (Limited number of quantifiable intervals)

Categorical
Ordinal (ordered categories)

Region of body injured by age category



Categorical
Dichotomous (Two categories)



Categorical
Nominal (Unordered categories)

Montage data: Football injuries (2013-2014: ER, 6-17 year old males)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Patient Sex	Patient Age	Organization	Patient Status	mrna	acca	Exam Completed Date	year	month	Exam Code	Report Text			
2	Male	13	CH	Emergency	20674900	2706182	11/22/2014 13:44	2014	11	HAND3	AP right Hand with 2 Views fifth digit History: {13 yo s/p football injury to			
3	Male	12	CH	Emergency	20383774	2677867	9/20/2014 18:31	2014	9	CTRAUMABR	Examination: CT of the head without contrast. History: Hit playing football			
4	Male	11	CH	Emergency	20427354	2518004	9/14/2013 14:30	2013	9	KNEE3	Addendum BeginsInitial report incomplete. Complete report as follows: H			
5	Male	11	CH	Emergency	20427354	2518005	9/14/2013 14:30	2013	9	FEMUR	Addendum BeginsInitial report incomplete. Complete report as follows: H			
6	Male	9	CH	Emergency	20535503	2721171	12/27/2014 9:43	2014	12	FINGER	AP left Hand with 2 Views fourth digit History: s/p football injury yesterda			
7	Male	19	CH	Emergency	20133004	2719927	12/23/2014 15:44	2014	12	UEXT	HISTORY: 19-year-old male with football helmet to thigh one month agon			
8	Male	12	CH	Emergency	20433798	2716117	12/15/2014 16:40	2014	12	KNEES	4 views right knee History: {football injury} Comparison: None Findings:B			
9	Male	14	CH	Emergency	20380881	2715666	12/15/2014 0:01	2014	12	HAND3	3 views right hand History: {football helmet to hand} Comparison: None F			
10	Male	12	CH	Emergency	20421615	2715287	12/13/2014 11:15	2014	12	HAND3	3 views right hand History: Playing football, hyperextended right third fing			
11	Male	17	OT	Outpatient	20655764	2714531	12/11/2014 16:39	2014	12	KNEE3	RIGHT KNEE SERIES 12/11/2014 4:39 PM CLINICAL INDICATION: 17-			
12	Male	16	CNI	Inpatient	20286919	2712859	12/8/2014 16:38	2014	12	FINGER	XR, finger(s), minimum of two views HISTORY: Football injury in August.			
13	Male	11	CH	Emergency	20657925	2710734	12/3/2014 17:37	2014	12	FINGER	AP left Hand with 2 Views index finger History: s/p playing football, L ind			
14	Male	12	CH	Emergency	20410999	2709997	12/2/2014 12:29	2014	12	KNEES	XR, knee; complete, four or more views HISTORY: Fell playing football 2			
15	Male	6	CH	Emergency	20833664	2709336	12/1/2014 10:21	2014	12	FOOT3	3 views right foot History: Injured right foot playing football yesterday Co			
16	Male	10	CH	Emergency	20504139	2709297	12/1/2014 9:20	2014	12	FINGER	AP RIGHT HAND WITH 2 VIEWS THE RIGHT THIRD FINGER History:			
17	Male	16	CH	Emergency	20256331	2709176	11/30/2014 18:25	2014	11	FORARM	2 views left forearm History: s/p football injury Comparison: None Finding			
18	Male	14	CH	Emergency	20639803	2708968	11/29/2014 16:32	2014	11	FINGER	AP right Hand with 2 Views thumb History: Jammed thumb into ground d			
19														

Next steps: Classification of body parts

1. Body part classification system created & applied
2. Confirm decisions (2nd radiologist)
3. Apply to all exams (need more information than exam codes?)

Next steps: Injury classification

1. Create injury classification system
2. Document & pretest the system
3. Apply the system (2 radiologists?)

Data management defined

All of the steps required to create a clean data set ready to be analyzed

Five parts of the process

1. Collect the data
2. Enter the data
3. Combine and clean data files
4. Recode, transform and derive new variables
5. Document and archive raw data sets

Three keys to success

1. Clarity
2. Consistency
3. Documentation

Next week

Nuts and bolts of good data management: Part II

(Data cleaning, recoding, archiving)