



Data Visualization in Neck and Lumbar Fracture

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Project Goal and Questions

- ▶ Finding causes of cervical and lumbar fracture in different age groups.
- ▶ Cumulatively, over the past 10 years (2009-2018), what was **the most common cause** of neck fracture in each age group?
- ▶ Over the past 10 years, what is happening to the annual incidence of these common causes of neck fracture in each age group?

Significance



Methods

- ▶ The National Electronic Injury Surveillance System (NEISS) is a database that collects data for every emergency department visit associated with a ~90 different causes of injury.

	A	B	C	D	E	F	G	H	I	J	K		
1	CPSC_Case_Numbr	Treatment_Date	Age	Sex	Race	Other_Race	Body_Part	Diagnosis	Other_Diagnosis		Disposition	Location	Fine_Amt
2	90134598	1/6/2009	86	2	1		89	57			4	1	
3	90130480	1/4/2009	85	2	1		89	57			6	1	
4	90130996	1/5/2009	82	2	1		89	57			4	1	
5	90123103	1/10/2009	92	2	3 ASIAN		89	57			4	1	
6	90123320	1/7/2009	92	1	1		89	57			2	1	
7	90123366	1/1/2009	74	2	0		89	57			4	1	
8	90122699	1/5/2009	81	2	1		89	57			1	1	
9	90134669	1/7/2009	37	1	0		89	57			1	1	
10	90134839	1/4/2009	21	1	0		89	57			4	9	
11	90125278	1/8/2009	2	2	1		89	57			1	1	
12	90125980	1/7/2009	97	2	3 UNKNOWN		89	57			1	5	
13	90128190	1/7/2009	80	1	2		89	57			4	1	
14	90129453	1/14/2009	89	2	0		89	57			2	1	
15	90132372	1/8/2009	74	2	1		89	57			1	0	
16	90134893	1/12/2009	88	1	1		89	57			4	5	
17	90134978	1/10/2009	87	2	1		89	57			4	5	
18	90135840	1/17/2009	33	1	1		89	57			4	0	
19	90136218	1/14/2009	47	1	1		89	57			4	1	
20	90137592	1/17/2009	78	1	1		89	57			1	0	
21	90140038	1/20/2009	75	1	1		89	57			2	5	
22	90142205	1/23/2009	83	1	3 HISPANIC		89	57			4	0	
23	90145719	1/23/2009	96	2	1		89	57			1	5	
24	90148117	1/20/2009	62	2	1		89	57			4	1	
25	90146212	1/23/2009	71	1	1		89	57			1	1	
26	90149309	1/26/2009	54	2	0		89	57			1	1	

Methods

- ▶ Neck fracture dataset

Around 500 rows in each year => 5000 in total

- ▶ Lumbar fracture dataset

Around 800 rows in each year after conditional formatting => 8000 in total

Methods

- ▶ Using Python & Seaborn – a library that support data visualization

```
In [103]: sns.set_style('whitegrid')

# Rounding the integer to the next hundredth value plus an offset of 100
def roundup(x):
    return 100 + int(math.ceil(x / 100.0)) * 100

sns.set(rc={'figure.figsize':(30,30)})
sns.countplot(x = age1['Product_1'],
              order = age1['Product_1'].value_counts().index)

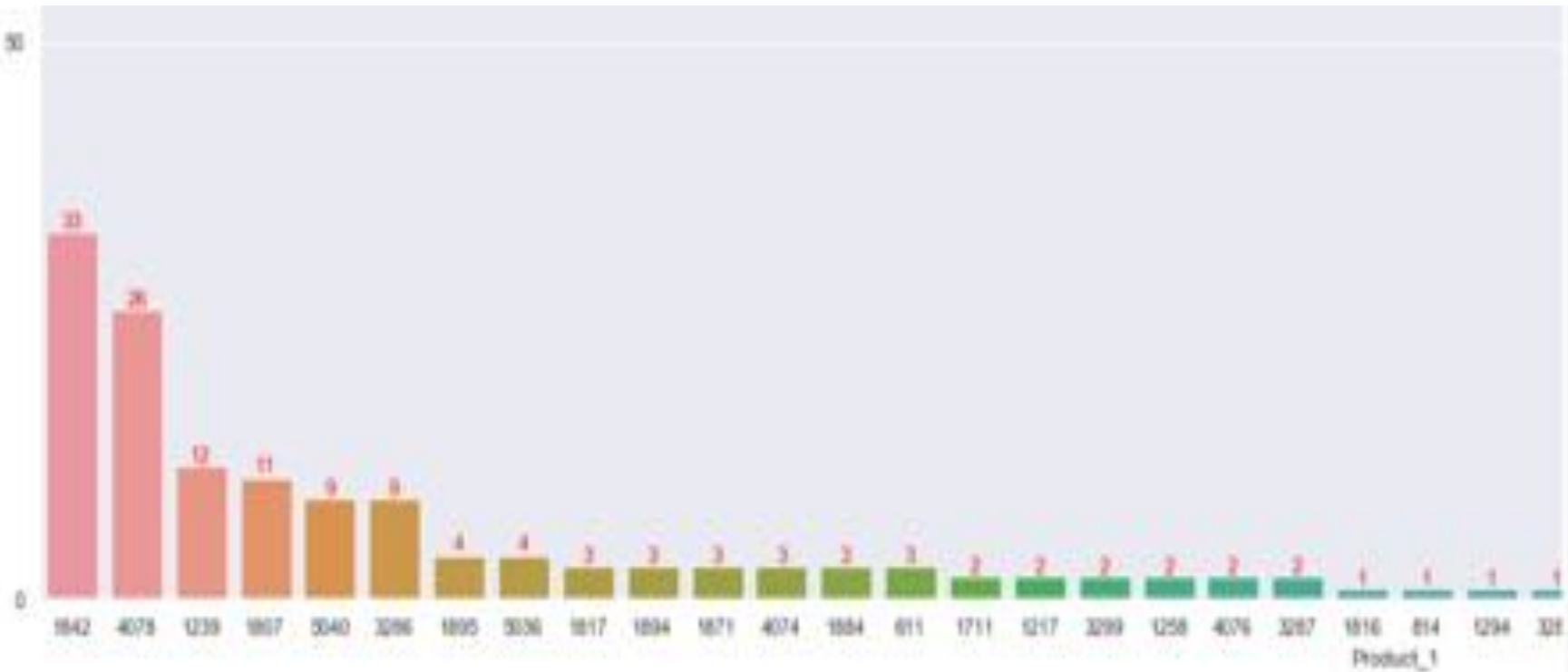
# Get current axis on current figure
ax = plt.gca()

# ylim max value to be set
y_max = df['Product_1'].value_counts().max()
ax.set_ylim([0, roundup(y_max)])

# Iterate through the list of axes' patches
for p in ax.patches:
    ax.text(p.get_x() + p.get_width()/2., p.get_height(), "%d" % int(p.get_height()),
           fontsize=12, color='red', ha='center', va='bottom')

plt.show()
```

Methods



Findings

Year 2018					Accumulative (2009-2018)								
Age group	Number of cases	Top reasons			Frequency	Age group	Number of cases	Top reasons			Frequency		
1	59	Horseback Riding			5	1	651	Football			46		
		Stairs or Steps	Two-Wheel Vehicles		4			Horseback Riding			43		
		Windows	Basketball	Bicycles	3			Stairs or Steps			39		
		Ladders			21			Sleds			27		
		Bicycles	Fences		11			2	1553	Stairs or Steps			314
		Floors			8			Ladders			192		
3	178	Stairs or Steps			53	3	2507	Horseback Riding			101		
		Garden Sprayers			46			Floors	Bicycles	88			
		Floors			26			Porches, Balconies			59		
		Bicycles			11			Ladders			406		
		Horseback Riding			9			Stairs or Steps			404		
4	410	Floors			33	4	4287	Floors			1208		
		Beds			44			Stairs or Steps	Beds	457			
		Stairs or Steps			43			Chairs			240		
		Chairs			24			Ladders			184		
		Ladders			22			Bathtubs, Showers			160		
5	150	Floors			47	5	1883	Floors			715		
		Beds			26								
		Chairs			12								
		Stairs or Steps			9								

Findings

► Neck fracture

- Group 1 (0-9 YO): monkey bars and playing ground
- Group 2 (10-19 YO): Football and bicycles
- Group 3 (20-29 YO): Stairs, bicycles and swimming pools
- Group 4 (30-39 YO): Stairs, bicycles and swimming pools
- Group 5 (40-49 YO): Stairs, bicycles and ladders
- Group 6 (50-59 YO): Stairs, bicycles and floors
- Group 7 (60-69 YO): Stairs and Floors
- Group 8 (70-79 YO): Stairs, floors and beds
- Group 9 (80+ YO): Stairs, floors and beds



Findings

► Lumbar Fracture

- Group 1 (0-19 YO): Football and Horseback Riding
- Group 2 (20-39 YO): Stairs and Ladders
- Group 3 (40-59 YO): Ladders and Stairs
- Group 4 (60-79 YO): Floors, Beds and Bathtubs
- Group 5 (80+ YO): Floors, Beds and Toilets

Findings

- ▶ Some highlights

- In 2018, in the third group, **Garden Sprayers** was the second most common cause for lumbar fracture with 46 cases (right after Stairs with 53 cases)



Findings

- ▶ Some highlights

In 2010, in the fourth and fifth group, **crutches and canes** were the third common causes for lumbar fracture.

=> Double misery



Lessons learned

- ▶ Working independent
- ▶ Excel Skill – unexpected but fun
- ▶ Be patient & detail oriented

	J	K	L	M	N	O	P	Q	R	S	
1	Disposition	Location	Fire_Involvement	Product_1	Product_2	Narrative_1	Narrative_2	Stratum	PSJ	Weight	
2	1	1	0	1211	0	17YOM, KICKING FOOTBALL AT HOME, SLIPPED T L3 OF LOWER BACK AREA		S		71	68.3455
3	1	0	0	1137	0	LOWER BACK COMPRESSION FX/MYOF SLIPPER AND FELL, NO LOC OR DIZZINESS. PT C/O LOWE		S		43	68.3455
4	4	1	0	679	1884	75 Y/O/F PUSHING COUCH AGAINST WALL AT HDX/ LUMBAR COMPRESSION FX		L		42	62.2225
5	1	1	0	1842	1807	LOW BACK PAIN S/P FALL R/O FX: 35YOF LOW B STEPS, CARPETED, ONTO LOW BACK AGAINST		S		66	68.3455
6	1	0	0	4074	0	74YO WHITE FEMALE GETTING UP FROM CHAIR ES TO R ABDOMEN & R LEG, DX L1 COMPRESSION		V		91	16.0885
7	4	1	0	1842	0	87YOF SLIPPED ON SOME ICE & FELL HIT R LOW PAIN MOSTLY IN R LOWER BACK & PELVIS REGI		S		47	68.3455
8	4	1	0	4074	1807	63YOF SLID OFF CHAIR TODAY ONTO FLOOR C/RISE PROCESS FX L4		M		54	37.4862
9	1	1	0	1842	0	LOWER BACK PAIN 2ND TO FALL, R/O FX: 51YOH STEPS @ HOME 4 DAYS AGO, LOW BACK, L SID		S		66	68.3455
10	1	1	0	1842	0	LOW BACK PAIN 2ND TO FALL, R/O FX: HE CHR BASKET OF LAUNDRY, TRIPPED OVER DOG, FELL		S		66	68.3455
11	5	1	0	4002	1807	FX L1 SPINE, S/P FALL: INTRACTABLE BACK PAIN FLOOR, TANGLED HIMSELF UP & FELL TO FLOOR		S		66	68.3455
12	1	1	0	4054	0	55YOM MOVING FURNITURE A FEW DAYS AGO: RESSION FRACTURE TO LOWER BACK		V		2	16.0885
13	4	1	0	1842	0	53 Y/O/M FELL DOWN STAIRS AT HOME AND IN DX/ LUMBAR SPINE FX		L		42	62.2225
14	4	1	0	4074	0	90 Y/O/M FELL OUT OF CHAIR AT HOME AND IN DX/ LUMBAR COMPRESSION FX		L		42	62.2225
15	4	1	0	649	0	87YOM WAS IN BATHROOM FELL BACK STRON SYNCOPE, COMPRESSION FRACTURE LOWER BA		L		69	62.2225
16	1	0	0	5036	0	23 YOM INJURED LOW BACK AND SHOULDER F R DX -L3 COMPRESSION FRACTURE, RIGHT SHOUL		M		78	74.5118
17	1	1	0	1817	0	POSSIBLE FX OF LOWER BACK/43YOM FELL ON I C/O PAIN TO HIS SACRUM/LOWER BACK.		S		43	68.3455
18	1	0	0	1239	0	16 YOM HORSEBACK RIDING FELL OFF HORSE, C DX FX LUMBAR VERTEBRA, CONTUSION HIP.		V		64	16.0885
19	1	1	0	4078	0	A 24 YR OLD MALE C/O LOWER BACK PAIN AFTE DX LUMBAR COMPRESSION FX		V		58	16.0885
20	4	1	0	1842	0	84 YOM SLIPPED ON 2 STAIRS; FELL. C/O LOW B DX: VERTEBRAL FX L2		M		54	37.4862
21	4	1	0	4074	0	A 79 YR OLD FEMALE WAS MOVING A CHAIR AT DX L2 COMPRESSION FX		V		58	16.0885
22	1	1	0	3277	0	35 Y/O/M FELL OFF CHIN UP BAR AT HOME AND DX/ LUMBAR COMPRESSION FX		L		42	62.2225
23	4	1	0	4076	0	101 Y/O/F FELL WHILE GETTING OUT OF BED AT DX/ LUMBAR FX		L		42	62.2225
24	4	1	0	811	0	76 Y/O/F FELL IN THE SHOWER AT HOME AND R DX/ LUMBAR FX		L		42	62.2225
25	1	9	0	5091	0	17 YOM SNOWBOARDING; FELL LANDED ON A FNOTED. DX: L2-3 TRANSVERSE PROCESS FX, BA		M		54	37.4862
26	1	0	0	1422	0	75 YOM JUMPED OFFED RUNAWAY LAWNMOWL DX-COCYX FRACTURE, LUMBAR STRAIN, PELVI		M		78	74.5118

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Questions & Comments

