

US Strikes in Yemen: Civilian Impact



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Some numbers

21 million in need of humanitarian aid. ($\frac{3}{4}$ total)
Nearly 15,000 civilians dead. (Almost half of UCLA)
54% decline in GDP (No comparison required)

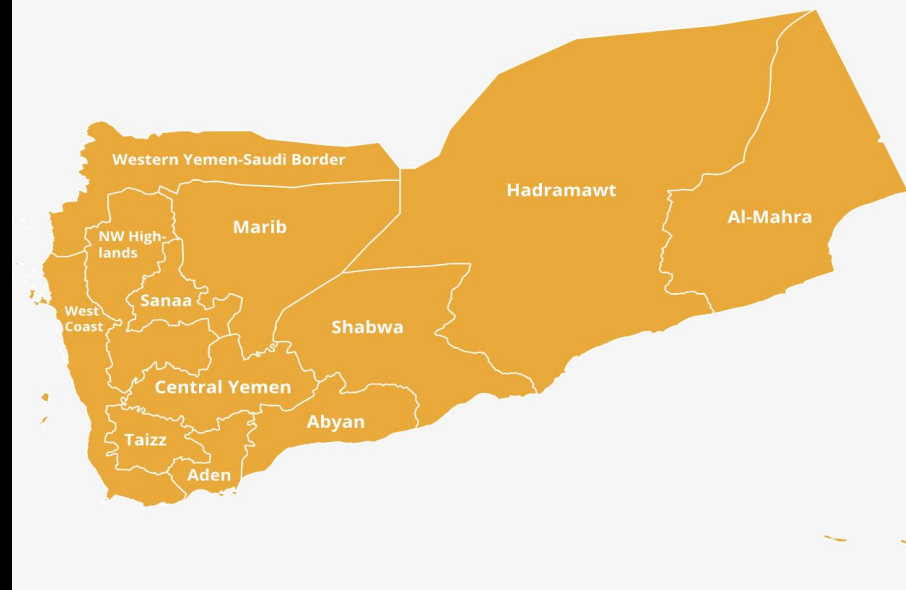
Geographical/Historical Context

The province of Abyan and its capital city of Zinjibar has been a highly contested territory over the years.

Abyan serves as a key supply route for oil and gas. And contains natural resources itself.

Power vacuum created by local government.

Sanaa is the largest city in Yemen with almost 2 million residents is Sanaa but has the lowest amount of casualties.



Average number of civilians killed by year.

Year of Date	Province								
	Abyan	Bayda	Damar	Hadhra..	Jawf	Marib	Multiple provinces	Sanaa	Shabwah
2009	44.00								
2010	10.00					3.50			
2011	42.50								3.50
2012	28.00	15.00		2.00					4.50
2013		12.00	2.00	4.50	1.00	5.50		2.00	
2014	1.00	16.50		1.00		0.50			9.00
2015				2.50					1.50
2016				3.00					
2017		25.00				5.00	1.00		5.50
2018		2.50		4.50					7.50

The flow

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The Data

- Data for 324 instances - 528 total strikes
- Lot of estimation - min/max
- Our focus: civilian death toll
- Strikes on 117 locations
- Mainly from 2009 to 2019

	Strike ID	Date	Location	Province	Type of attack	Confirmed_possible US attack	Air operation	Drone strike	Minimum number of strikes	Maximum number
1	YEM001	03/11/2002	Unknown	Marib	Drone strike	Confirmed		1	1	1
2	YEM002	17/12/2009	Al Majala	Abyan	Cruise missile strike	Confirmed		0	0	1
3	YEM003	17/12/2009	Arhab	Sanaa	US-Yemen ground operation Possible drone strike	Confirmed		0	0	1
4	YEM004	24/12/2009	Rafd	Shabwa	Airstrike Possible cruise missile strike	Confirmed		1	0	1
5	YEM005	12/01/2010	Unknown	Shabwa	Yemen ground operation Possible US assistance	Possible		0	0	1
6	YEM006	15/01/2010	Al Ajashir	Saada	Airstrike	Possible		1	0	1
7	YEM007	20/01/2010	Erq al Shawan	Marib	Airstrike	Possible		1	0	4
8	YEM008	31/01/2010	N/A	Across Yemen	US ground operations	Possible		0	0	24
9	YEM009	14/03/2010	Jeezat al Qotn Moudia district	Abyan	Airstrike	Confirmed		1	0	1
10	YEM010	15/03/2010	Moudia	Abyan	Airstrike	Possible		1	0	1
11	YEM011	24/05/2010	Unknown	Marib	Airstrike	Confirmed		1	0	1
12	YEM012	05/05/2011	Unknown	Shabwa	Drone strike Airstrike with US conventional aircraft	Confirmed		1	1	1
13	YEM013	03/06/2011	Zinjibar	Abyan	Drone strike	Confirmed		1	1	1
14	YEM014	10/06/2011	Zinjibar	Abyan	Airstrike Possible drone strike	Possible		1	1	1
15	YEM015	10/06/2011	Raia	Abyan	Airstrike Possible drone strike	Possible		1	1	1
16	YEM016	18/06/2011	Jaar	Abyan	Airstrike Possible drone strike	Possible		1	1	1
17	YEM017	14/07/2011	Wadea district Mudiya	Abyan	Drone strike	Confirmed		1	1	1
18	YEM018	14/07/2011	Unknown	Abyan	Drone strike	Possible		1	1	1
19	YEM019	27/07/2011	Karadeef Zinjibar	Abyan	Airstrike Possible drone strike	Possible		1	1	1
20	YEM020	01/08/2011	Al Khamila	Abyan	Drone strike Possible Yemen Air Force airstrike	Confirmed		1	1	2
21	YEM021	24/08/2011	Zinjibar	Abyan	Airstrike	Possible		1	0	1
22	YEM022	24/08/2011	Arkoub	Abyan	Airstrike Possible drone strike	Possible		1	1	1
23	YEM023	25/08/2011	Wadi Hassan	Abyan	Airstrike	Possible		1	0	1
24	YEM024	31/08/2011	Unknown	Abyan	Airstrike	Confirmed		1	0	2
25	YEM025	05/09/2011	Jaar	Abyan	Airstrike	Possible		1	0	1
26	YEM026	05/09/2011	Jaar	Abyan	Airstrike	Possible		1	0	2
27	YEM027	07/09/2011	Mahfed	Abyan	Drone strike	Confirmed		1	1	2
28	YEM028	21/09/2011	Mahfed	Abyan	Drone strike	Confirmed		1	1	1
29	YEM029	21/09/2011	Shagra	Abyan	Airstrike	Possible		1	0	1
30	YEM030	30/09/2011	Jawf	Jawf	Drone strike	Confirmed		1	1	1
31	YEM031	05/10/2011	Al Arqoub	Abyan	Airstrike Possible drone strike	Possible		1	1	1
32	YEM032	14/10/2011	Azzan	Shabwa	Drone strike	Confirmed		1	1	1
33	YEM033	14/10/2011	Azzan	Shabwa	Drone strike	Confirmed		1	1	1
34	YEM034	14/10/2011	Unknown	Southern Yemen	Airstrike Possible drone strike	Possible		1	1	1
35	YEM035	14/10/2011	Azzan	Shabwa	Airstrike Possible drone strike	Possible		1	1	1
36	YEM036	22/12/2011	Zinjibar	Abyan	Airstrike Possible drone strike	Possible		1	1	1

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Methodology

- Luckily no missing values
- Filtered our necessary columns to only include civilian death toll/injuries
- Variable transformations/aggregations wherever necessary.
- Techniques used: Hypothesis testing (mean and variance), EDA

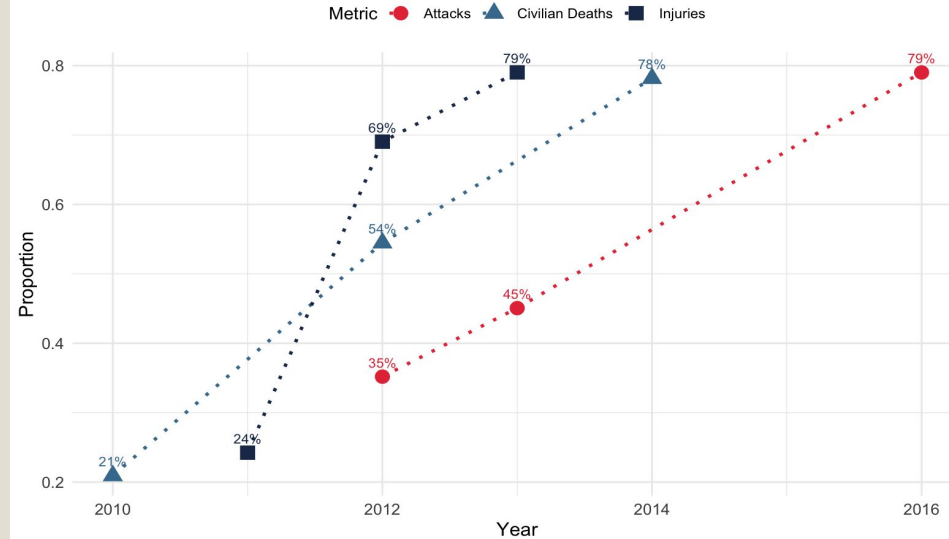
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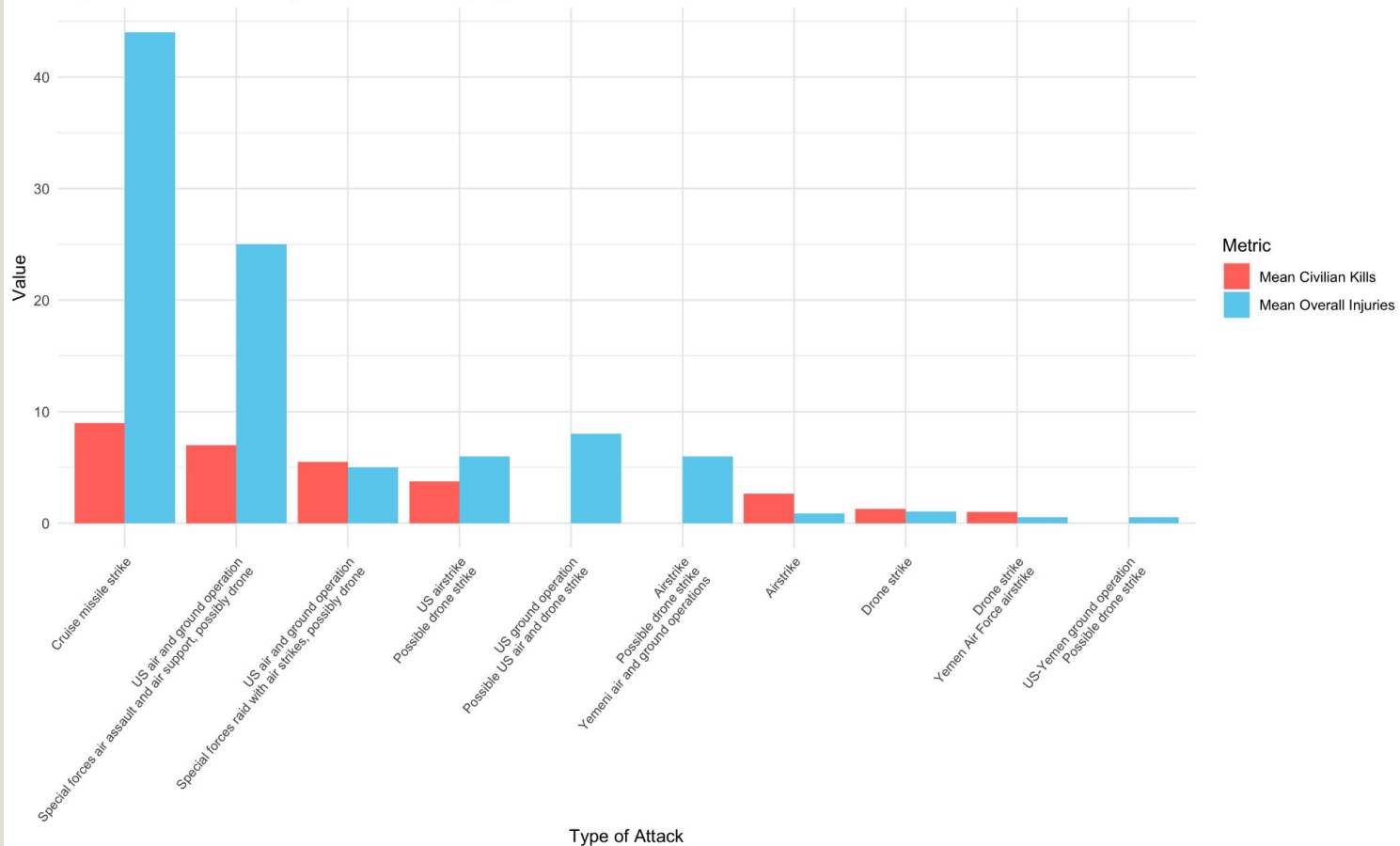
When Did The Damage Occur?

By 2012, the majority of injuries occurred (69%) and a similar trend was observed in civilian deaths (54%). However, attacks took the longest to accumulate, reaching only 35%. Our data suggest that early strikes were significantly more lethal.

Timeline of Attacks, Deaths, and Injuries



Top 10 Mean Kills and Injuries Per Strike by Type of Attack



Key theme: lots of drone involvement

Does “*confirmed*” or
“*possible*” classification
increase variance of the
kill range?

F test to compare two variances

data: confirmed and possible

F = 0.13478, num df = 214, denom df = 108, p-value < 2.2e-16

alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:

0.09616352 0.18552679

sample estimates:

ratio of variances

0.1347762

**Yes it does, the “possible” labels have a
higher range of the death toll.**

Conclusion



U.S Strikes that were carried out earlier in decade were statistically more deadly for civilians.

Civilians were not the main target of the conflict.

Focus was on capturing land to the interested party. And gaining power.

Al-Qaeda in this case.

Deeper analysis and additional data required to uncover potential motives.

THANK YOU !