

Dicing with death: recent military fatalities in Afghanistan and Iraq by weekday and cause (improvised explosive device, or non-hostile deaths)

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Summary

a) In PERIOD 3 (5 February to 24 June 2007, 140 days), fatality rate of UK troops was equally high in Afghanistan & Iraq: 8 deaths per 1,000 personnel-years (95% CI: 5.4 – 10.5).

b) In Afghanistan in PERIOD 3, UK and Canadian fatalities were 31, consistent with the projection of 25 (as singleton deaths or in small clusters) by Bird and Fairweather¹, who took seasonality and deployment into account.

c) In Afghanistan in PERIODS 1+2+3 (1 May 2006 to 24 June 2007, 420 days), Canadian troops have sustained heavy losses (45 deaths from an estimated deployment 2,250 to 2,500 troops) of 17 per 1,000 personnel-years (95% CI: 12 to 22).

d) In Iraq in PERIOD 3, UK fatalities doubled to 23 from an estimated deployment of 7,000 down to 5,500 troops versus 12.3 deaths expected if hostilities had continued as in PERIODS 1+2 ($p < 0.005$). Sharp rise in US fatality rate from 5 to 7 deaths per 1,000 personnel-years was already evident in PERIOD 2.

e) In Iraq in PERIOD 3, fatalities per fatal IED (only) incident increased to 280 deaths in 155 fatal IED (only) incidents versus expected 249 IED (only) fatalities based on IED incidents' lethality in PERIOD 2 (18 September 2006 to 4 February 2007: 217 fatalities in 135 fatal IED (only) incidents).

g) By contrast, non-hostile deaths in Iraq in PERIODS 1+2+3 (1 May 2006 to 24 June 2007: 130 non-hostile deaths in 420 days) were equally likely to occur on any day of the week.

h) In the 140-day PERIOD 4 (25 June to 11 November 2007), from a combined deployment of 13,200 troops (and just over 5,000 personnel-years), our expectation is 40 UK military fatalities (95% CI: 27 to 49) in Afghanistan+Iraq as singleton deaths or in small clusters.

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1. Background and rationale

Our analyses^{1,2} rely on icasualties.org, to which we make acknowledgement. Date and cause of fatalities on icasualties.org are subject to change (see below) as well as to updating.

Bird and Fairweather¹ showed that the vast majority of coalition fatalities in Operation Iraqi Freedom in 2006 to 17 September was ascribed as hostile (85%: 457/537). In particular, improvised explosive devices (IEDs) accounted for 53% of all fatalities, and for 62% of hostile deaths (282/457: 95% CI from 57% to 66%). When investigating the lethality of IEDs, Bird and Fairweather focused on those deaths which were ascribed on icasualties.org to IEDs only. They did not include multiply-ascribed deaths, such as those ascribed to IED and small arms fire or to IED and rocket propelled grenade/grenades of which there were 16 and two respectively in PERIOD 3.

Accordingly, Bird and Fairweather reported on 271 deaths in 183 fatal IED (only) incidents in Iraq in 2006 to 17 September (260 days), and 222 deaths in 142 fatal IED (only) incidents in the subsequent 140 days (PERIOD 2 = 18 September 2006 to 4 February 2007), a pooled mean of 1.5 deaths per fatal IED (only) incident.

For the first time, this update incorporates fatalities in PERIOD 3 (5 February 2007 to 24 June 2007).

We have not previously analysed fatalities by weekday but now do so: one of us had sensed that news reports of military fatalities were more common at the weekend, and the other - by experience - recognised that military intelligence needs to be aware of weekday patterns that may have operational implications.

2. Methods briefly

Our updated analysis is by 140-day PERIOD, where PERIOD 1= 1 May to 17 September 2006, PERIOD 2= 18 September to 4 February 2007, PERIOD 3= 5 February to 24 June 2007. It is based on accessing icasualties.org on 16, 17, 27 June and 2 July 2007 and, as in Bird and Fairweather¹, we analyse the lethality of IED (only) incidents, see also above.

We report fatality rates per 1,000 personnel-years. Four thousand troops in a theatre of operation for 3 months contribute 1,000 personnel-years. So too do 1,000 personnel in theatre for one year.

We focus on the weekday of occurrence of fatal IED (only) incidents and, for comparison, of non-hostile deaths. Deaths which relate to a fatal IED (only) incident but post-date the incident are coded by IED incident date. Non-hostile deaths are coded by the date of death

although clusters of non-hostile deaths do also occur, such as in helicopter or other vehicle accidents.

We concentrate on recent military fatalities because only these can have current operational implications, and hence on PERIODS 2+3 during which there has been an increase in the rate and/or lethality of fatal IED incidents.

For analysis of non-hostile deaths by weekday to be based on sufficient numbers of such deaths (at least $7 * 16 = 112$), non-hostile deaths in PERIODS 1+2+3 have been analysed.

Our next update will relate to 140-day PERIOD 4 (25 June to 11 November 2007) when UK's deployment to Iraq has reduced to 5,500 troops^{3 4} and to Afghanistan has increased to 7,700^{5 6}.

3. RESULTS

3.1 Fatalities in Afghanistan and Iraq in PERIODS 1+2¹ and PERIOD 3

TABLE 1 summarises coalition military fatalities by nationality in Iraq and Afghanistan. The data for PERIODS 1+2 are reproduced from Bird and Fairweather¹.

TABLE 1: Coalition military deaths and estimated fatality rates per 1,000 personnel-years in consecutive 140-day PERIODS

<i>Theatre</i>	<i>Iraq</i>			<i>Afghanistan</i>		
<i>PERIODS, each of 140 days</i>	<i>1 May to 17 Sept. 2006</i>	<i>18 Sept. to 4 Feb. 2007</i>	<i>5 Feb. to 24 June 2007</i>	<i>1 May to 17 Sept. 2006</i>	<i>18 Sept. to 4 Feb. 2007</i>	<i>5 Feb. to 24 June 2007</i>
Total fatalities	299	436*	490	117	40	96
US (estimated deployment)	280 (145,000 troops)	416 (145,000 troops)	463 (<= 165,000 troops)	54**	18	50***
UK (estimated deployment; & person-years, pys)	14 (7,200 troops)	12 (7,000 troops)	23 (7,000 troops down to 5,500 ^{3 4} ; 2,586 pys)	33** (4,500 troops)	6 (up to 5,250 troops)	15 (5,250 thro' 6,000 up to 6,900 troops ^{5 6} ; 2,186 pys)
Canada (estimated deployment)	No deployment			17 (2,250 troops)	12 (2,250 troops)	16 (2,500 troops ⁷)
Other	5	8	4	13	4	15
<i>Estimated fatality rates per 1,000 personnel-years (95% Poisson uncertainty)</i>						
US	5.0 (4.4 to 5.6)	7.5 (6.8 to 8.2)	7.3 (6.6 to 8.0)			
UK/Canada	4.8 (3.1 to 7.0)		8.8 (5.6 to 13.3)	19 (14 to 25)	6 (4 to 11)	10 (7 to 14)

* Now shown as 437 on icasualties.org.

** Includes large clusters of 10 US and 14 UK deaths respectively.

*** Includes a large cluster of eight US deaths.

In PERIODS 1+2+3 (420 days), there have been 54 UK deaths in Afghanistan in estimated 1,726+2,014+2,186 = 5,926 personnel-years, a cumulative fatality rate of 9.1 per 1,000 personnel-years (95% CI: 6.7 – 11.5); and 49 UK deaths in Iraq in 8,033 personnel-years, a fatality rate of 6.1 per 1,000 personnel-years (95% CI: 4.4 – 7.8).

In the most recent PERIOD 3, UK troops have encountered similarly lethal hostilities in their two distinct theatres of operation (Afghanistan and Iraq): UK fatalities were 38 in estimated 4,772 personnel-years, a PERIOD 3 fatality rate of 8.0 UK deaths per 1,000 personnel-years (95% confidence interval: 5.4 to 10.5), and at least equivalent to UK's fatality rate during the initial period of major combat in Iraq in 2003.

In Iraq, there is evidence that the UK fatality rate has increased very significantly in PERIOD 3 compared to PERIODS 1+2 (observed 23 fatalities versus 12.3 expected, $p < 0.005$) whereas the sharp rise in US fatality rate in Iraq clearly began from PERIOD 2.

In Afghanistan in PERIOD 3, there were two large (7+ fatalities) clusters of deaths: eight US deaths in a helicopter crash, and seven lives lost when a helicopter was brought down in a rocket propelled grenade attack (5 US, 1 Canadian, 1 UK). On PERIOD 2 deployments and a seasonal 60:40 basis, Bird and Fairweather¹ had projected 25 UK and Canadian fatalities (as singleton deaths or in small clusters), with which the 31 observed deaths are sadly consistent.

In Afghanistan in PERIODS 1+2+3 (420 days), there have been 45 Canadian deaths despite Canada's deployment being *at most* half the UK's so that there is reason to question the onerously high Canadian losses of 17 per 1,000 personnel-years (95% CI: 12 to 22).

3.2 Fatal IED (only) incidents, and increased fatalities per fatal IED incident: Iraq
TABLE 2 shows military fatalities in IED (only) incidents in Iraq and Afghanistan. The data are updated from Bird and Fairweather¹ because, when icasualties.org was accessed in June 2007, we identified only 217 fatalities in 135 fatal IED incidents for PERIOD 2 (18 September 2006 to 4 February 2007: 140 days), fewer than reported previously¹.

In Iraq, as reported previously¹, the rate at which fatal IED (only) incidents occurred had increased by 37% in PERIOD 2 (to one per day) compared to BASELINE (0.7 per day). That increase was sustained in PERIOD 3.

PERIOD 3 (5 February 2007 to 24 June 2007) in Iraq accounted for 280 fatalities in 155 fatal IED (only) incidents. Although the number of fatal IED incidents had not increased significantly from PERIOD 2, their lethality had.

Had there been no change in lethality from BASELINE + PERIOD 2, 155 fatal IED (only) incidents in Iraq would have resulted in 237.9 IED fatalities rather than 280 observed, $p < 0.01$. Lethality may even have increased in PERIOD 3 compared to PERIOD 2: 280 IED (only) deaths are set against an expectation of 249.1 based on IED incidents' lethality in PERIOD 2, $p \sim 0.05$.

Remarkably, in PERIOD 3, in both Iraq (5) and Afghanistan (1), there were fatal IED (only) incidents which claimed 6+ lives. There were no such incidents previously in Afghanistan, nor were there any in Iraq from 1 January 2006 to 4 February 2007.

TABLE 2: IED fatalities in Iraq and Afghanistan

<i>Theatre</i>	<i>Fatal IED incidents in Iraq</i>				<i>In Afghanistan</i>	
PERIOD & Number of deaths in a fatal IED incident	BASELINE: 1 Jan. to 17 Sept. 2006 (271 IED deaths in 183 fatal IED incidents in 260 days)	REVISED PERIOD 2: 18 Sept. 2006 to 4 Feb. 2007 (217 IED deaths in 135 fatal IED incidents in 140 days)	POOLED BASELINE + PERIOD 2: (488 IED deaths in 318 fatal IED incidents in 400 days)	PERIOD 3: 5 Feb. to 24 June 2007 {POOLED-expectation} (280 IED deaths in 155 fatal IED incidents in 140 days)	76 IED deaths in 46 fatal IED incidents from 1 Oct. 2001 to 4 Feb. 2007	22 IED deaths in 12 fatal IED incidents from 5 Feb. to 24 June 2007, 140 days
1	128	88	216	97 { 105.3 }	28	8
2	33	23	56	22 { 27.3 }	11	1
3	14	14	28	20 { 13.6 }	2	2
4	5	9	14	10 { 8.8 }	5	0
5	3	1	4	1		0
6+				5		1
TOTAL	183	135	318	155	46	12
<i>Fatal IED incidents per day</i>	0.7	1.0		1.1		
<i>Mean deaths per fatal IED incident</i>	1.5	1.6	1.5	1.8	1.7	1.8

3.3 Weekday variation in Iraq's fatal IED (only) incidents, fatalities per fatal IED incident and IED (only) deaths: analysis of PERIODS 2+3

We focus on PERIODS 2+3 because, as shown above, fatal IED (only) incident rate and/or IED incidents' lethality had increased compared to BASELINE.

Essential data for PERIODS 2+3 on 290 fatal IED (only) incidents - in which there were 497 deaths - are summarised in **TABLE 3** by day of the week. In these 40 weeks, the expected number of fatal IED (only) incidents per day of the week was 41.1, roughly one a day, and of IED (only) fatalities was 71.0.

3.4 Absence of variation by weekday in non-hostile deaths in Iraq: analysis of PERIODS 1+2+3

By contrast **TABLE 4**, which relates to 130 non-hostile deaths in Iraq in PERIODS 1+2+3 (1 May 2006 to 24 June 2007, 420 days), illustrates what Poisson variation actually looks like about a common expectation of $130/7 = 18.6$ non-hostile deaths per weekday.

TABLE 4 shows no evidence of heterogeneity by day of the week in the numbers of non-hostile deaths ($\chi^2 = 4.72$ on 6 degrees of freedom, which is entirely consistent with χ^2 expectation of 6.0 on 6 degrees of freedom).

TABLE 4: Observed non-hostile fatalities in Iraq by weekday of death versus common expectation of 18.4 by weekday during 1 May 2006 to 24 June 2007

PERIODS	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	TOTAL
1+2+3	16	22	16	19	13	20	24	130

4. DISCUSSION

4.1 Afghanistan versus Iraq: dicing with death

In Afghanistan in PERIODS 1+2+3 (420 days), UK troops’ fatality rate of 9 per 1,000 personnel-years (95% CI: 7 - 12) was 50% greater than their death-rate in Iraq of 6 fatalities per 1,000 personnel-years (95% CI: 4 - 8). Canada’s high military fatality rate throughout PERIODS 1+2+3 of 17 deaths per 1,000 personnel-years (95% CI: 12 to 22) in Afghanistan warrants closer scrutiny.

In the most recent PERIOD 3, UK troops have encountered similarly lethal hostilities in both theatres of operation (Afghanistan and Iraq): a fatality rate of 8 UK deaths per 1,000 personnel-years (95% CI: 5 - 11), and at least equivalent to UK’s fatality rate during the initial short period of major combat for Iraq - but sustained for longer, by fewer troops.

Contrary to recent reports in the British press, the marked rise in UK fatalities in Iraq in PERIOD 3 was highly significant and, moreover, was anticipated by an earlier sharp increase in US fatalities rate in PERIOD 2. The US rate of 7 deaths per 1,000 personnel-years has been sustained into PERIOD 3 despite a surge of up to 20,000 additional US troops. This extra deployment may have displaced some insurgents in PERIOD 3 to operate in other regions of Iraq, including those patrolled by British forces.

4.2 Afghanistan and Iraq: projection of UK military fatalities in PERIOD 4

If UK’s combined deployment in Afghanistan and Iraq is around 13,200 troops in PERIOD 3, and if the combined-theatres’ fatality rate continues at 8 per 1,000 personnel-years (95% confidence interval: 5.4 to 10.5; as singleton deaths or in small clusters, that is: without any clusters of 7+ UK deaths), then - in expectation – we may have 40 deaths (95% CI: 27 to 49). Moreover, actual deaths will exhibit *at least* Poisson variation about this expectation.

4.3 Increased lethality of IEDs in Iraq

Bird and Fariweather¹ identified that the frequency of fatal IED (only) incidents in Iraq had increased very significantly (by 37%) in PERIOD 2 compared to earlier in 2006, but that the mean number of deaths per fatal IED incident was essentially unchanged, there having been 1.5 deaths per fatal IED (only) incident overall.

In PERIOD 3, a further important change in IEDs has occurred. Their lethality has increased markedly since 155 fatal IED incidents claimed 280 lives, not the hitherto-expected 238, or even 249 (if based on PERIOD 2 only). Unprecedented in Afghanistan or in Iraq in 2006 were fatal IED incidents which claimed 6+ lives – five such incidents in Iraq and one in Afghanistan.

Although not demonstrable statistically for Afghanistan, there must be military concern that a common source for IEDs may servicing both theatres of operation so that the already-statistically-demonstrable increased lethality in Iraq in PERIOD 3 is a forewarning for Afghanistan with, already, an IED incident of six fatalities.

4.4 Missing data impinge on interpretations of weekday IED patterns in Iraq

It is important to recognise that key data are missing from **TABLE 3**: the numbers of IED-vulnerable vehicle journeys per weekday for PERIODS 2+3 in Iraq, and numbers of military personnel carried per weekday in IED-vulnerable vehicles.

For the most part, US military intelligence will hold the above data since the vast majority of the coalition forces in Iraq is from the US. However, just as the rise in US fatality rate in PERIOD 2 presaged a corresponding increase in PERIOD 3 for UK personnel, so may US intelligence about the weekday pattern of fatal IED incidents, if shared, forewarn, and forearm, coalition partners in Iraq.

Our interpretations can be merely speculative because we lack the necessary contextual and intelligence data which the coalition forces can themselves use (and may already have done so) to better interpret the above statistical observations. Lacking these data, it appears that patterns have been sustained during PERIODS 2+3 that may warrant disruption, including by variations in operational movements.

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