Post-surge and UK-withdrawal from Basra City, and with Musa Quala re-taken: recent military fatalities in Afghanistan and Iraq by cause and nationality (issue date: 15 April 2008)

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Summary

Afghanistan & Iraq: a) In PERIOD 5 (12 November 2007 to 30 March 2008, 140 days), which follows the withdrawal of UK troops from Basra City and covers both the winter in Afghanistan and the re-taking of Musa Quala, the fatality rate of UK troops was thankfully low both in Afghanistan {8 fatalities in 2,692 personnel-years (pys)} & Iraq {5 fatalities in 1,603 pys}, namely: 3 deaths per 1,000 personnel-years (95% CI: 1.6 – 5.2).

***Afghanistan*:** b) In PERIODS 1+2+3+4 (1 May 2006 to 11 November 2007, 560 days), Canadian losses were 56 deaths in 3,654 personnel-years, or 15 per 1,000 personnel-years (95% CI: 11 to 19), and so around 70% higher than the UK's fatality rate of 9 per 1,000 personnel-years (95% CI: 7 to 11) based on 76 fatalities in 8,585 personnel-years. In PERIOD 5, Canadian fatalities were again significantly high: 10 deaths in 962 personnel-years (95% CI: 5 to 19 per 1,000 pys).

***Afghanistan's fatal IED (only) incidents*:** c) Fatal IED (only) incidents had doubled in frequency in PERIOD 4 when 27 incidents caused 44 fatalities compared to 12 (causing 22 fatalities) in PERIOD 3. In PERIOD 5, fatal IED (only) incidents remained high at 29 incidents, and caused 37/59 ISAF fatalities (63%).

Iraq's fatal IED (only) incidents: d) By contrast, fatal IED (only) incidents in Iraq had nearly halved in frequency in PERIOD 4 when there were 86 (causing 136 deaths) compared to 155 (causing 280 deaths) in PERIOD 3. In PERIOD 5, fatal IED (only) incidents were further dramatically reduced to 48 (causing 78 deaths, which represented half the military fatalities in PERIOD 5). Unusually, one of these fatal IED incidents was 'house-borne': it caused six US fatalities.

Iraq: e) Relative to PERIOD 3, UK military fatality rate had *risen again* in the first half of PERIOD 4 ($p \sim 0.07$) to 14 per 1,000 personnel-years (95% CI: 8 to 23, based on 15 deaths in 1,058 pys) but, following the withdrawal of UK troops from Basra City, it fell dramatically in the second half of PERIOD 4 to 3 per 1,000 personnel-years (95% CI: 1 to 9, based on 3 non-hostile deaths in 962 pys), and has remained so in PERIOD 5 (3 per 1,000 personnel-years; 95% CI: 1 to 7, based on five fatalities, three non-hostile, in 1,603 pys).

Iraq: *f*) By contrast, the US's post-surge fatality rate had *decreased very significantly* in the first half of PERIOD 4 to 5.7 per 1,000 personnel-years (95% CI: 4.9 to 6.5, based on 177 deaths in 31,154 pys). There was a *further, highly significant decrease* in the second half of PERIOD 4 to 3.7 per 1,000 personnel-years (95% CI: 3.0 to 4.4, based on 116 deaths in equivalent pys) - significantly below the level of a year previously in PERIOD 1 (1 May to 17 September 2006), when it was 5.0 per 1,000 personnel-years (95% CI: 4.4 to 5.6). There was a *further, highly significant decrease* in the US military fatality rate in PERIOD 5 to 2.5 per 1,000 personnel-years (95% CI: 2.1 to 2.9, based on 151 deaths in 59,615 pys).

Friendly fire: g) In PERIODS 1+2+3+4, friendly fire claimed one Canadian (4 September 2006) and at least four British lives (23 August 2007; 20 August 2006) in Afghanistan, and two US lives in Iraq (2 February 2007): all seven in major combat. In January 2008, during PERIOD 5, two Dutch soldiers (and two Afghan troops) were killed by Dutch friendly-fire.

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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 Fairweather[1] 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%). Bird and Fairweather also reported on IED lethality: 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.

Post-surge and post-UK-withdrwal from Basra City, this update incorporates fatalities in PERIOD 5 (12 November 2007 to 30 March 2008: **156 deaths in Iraq, 59 in Afghanistan**) during which Musa Quala was re-taken from the Taleban[3]. UK troops were withdrawn from Basra on 3 September 2007 midway through PERIOD 4.

UK troop numbers in Iraq are shown as having decreased to 5,000 in the second half of PERIOD 4[4 5]. In PERIOD 5, there has been much debate about UK troop numbers in Iraq[6-8] - we shall assume there to have been roughly 4,500 troops present from 12 November until the end of 2007; and around 4,000 thereafter. UK troops in Afghanistan continued at 7,000[9 10] with the US contingent being reckoned at 31,000 [11-14]. PERIOD 6 is 31 March 2008 to 17 August 2008.

2. Methods briefly

Our analyses relate primarily to 140-day periods:
PERIOD 1= 1 May to 17 September 2006,
PERIOD 2= 18 September to 4 February 2007,
PERIOD 3= 5 February to 24 June 2007 {based on accessing icasualties.org on 16, 17, 27 June and 2 July 2007},
PERIOD 4= 25 June to 2 September 2007, and 3 September to 11 November 2007 {from icasualties.org on 9 and 14 November 2007}, and
PERIOD 5= 12 November 2007 to 30 March 2008 {from icasulaties.org on 3 April 2008}.

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. Analytically, we characterise "major combat" by a military fatality rate of 6 or more per 1,000 personnel-years.

We analyse the lethality of IED (only) incidents. As in Bird and Fairweather[1], we exclude from this analysis multiply-ascribed deaths, such as IED and small arms fire (16 and ***17*** in PERIOD 3 and PERIOD 4 respectively) or IED and rocket propelled grenade/grenades (two and ***two*** respectively). A singleton fatal IED attack in Iraq during PERIOD 5 in which a suicide vehicle was used has been coded as 'suicide bomb' rather than IED.

In PERIOD 5, UK's deployment to Iraq reduced below 5,000 troops[6-8] and to Afghanistan was to have increased to 7,700, but seems to have remained at around 7,000[3]. Withdrawal of some 20,000 US combat troops from Iraq during PERIOD 5 was announced by President Bush: we have assumed that their number has effectively stood at 155,000 throughout PERIOD 5[11-14] whereas US troops in Afghanistan have been reckoned at 31,000[11] throughout PERIOD 5.

The next update will relate to the 140-day PERIOD 6 (31 March 2008 to 17 August 2008).

3. RESULTS

3.1 Fatalities in Afghanistan and Iraq in PERIODS 1+2[1]; PERIOD 3+4; & PERIOD 5

TABLE 1a summarises coalition military fatalities by nationality in Iraq and Afghanistan in PERIODS 1+2+3+4. The data for PERIODS 1+2 are reproduced from Bird and Fairweather[1] and for PERIODS 3+4 from earlier reports on MRC Biostatistics Unit website.

Recall that, in the first half of PERIOD 4, the UK fatality rate in Iraq rose to 14 per 1,000 personnel-years (95% CI: 8 to 23) whereas the US fatality rate in Iraq fell to 5.7 per 1,000 personnel-years (95% CI: 4.9 to 6.6) or less (see **TABLE 1a**), and so reverted to its level a year previously, see PERIOD 1.

The second half of PERIOD 4 began on the day after UK troops had withdrawn from Basra City. UK military fatality rate in Iraq fell to 3 per 1,000 personnel-years (95% CI: 1 to 9, based on three non-hostile deaths in 962 pys) in the second half of PERIOD 4 when there was also a highly significant further reduction in US military fatality rate to 3.7 deaths per 1,000 personnel-years (95% CI: 3.0 to 4.4), lower even than in PERIOD 1.

In PERIOD 5, US and UK troop numbers declined in Iraq but so too, much more dramatically, did fatalities (see **TABLE 1b:** 156 deaths, 29 of them from non-hostile cause). The US military fatality rate in PERIOD 5 fell to 2.5 per 1,000 pys (95% CI: 2.1 to 2.9). UK fatalities were also mercifully few at five giving an UK equivalent fatality rate of 3 per 1,000 pys (95% CI: 1.6 to 2.5).

TABLE 1a: Coalition military deaths and estimated fatality rates per 1,000 personnel-years in consecutive 140-day or 70-day PERIODS; friendly fire deaths superscripted [F]

Theatre	***Iraq***					***Afghanistan***			
PERIODS of 140 days, except where indicated	*1 May to 17 Sept. 2006*	*18 Sept. to 4 Feb. 2007*	*5 Feb. to 24 June 2007* ***SURGE***	*25 Jun to 2 Sept. 2007 (70days)* ***SURGE***	*3 Sep to 11 Nov. 2007 (70days)* ***SURGE***	*1 May to 17 Sept 2006*	*18 Sept to 4 Feb. 2007*	*5 Feb. to 24 Jun 2007*	*25 Jun to 11 Nov. 2007*
Total fatalities *(non-hostile, see footnotes)*	299 *(32)*	436* *(56)*	490* *(42)*	193 *(43)*	123 *(36)*	117 *(41)*	40 *(4)*	96 *(27)*	114 *(16)*
US (estimated deployment)	280 (145,000 troops)	416[FF] (145,000 troops)	463 (<= 165,000)	177**** (162,000[8] - 168,000 troops[9])	116**** (minimum 162,000 troops[8])	54**	18	50***	58
UK (estimated deployment) **& person-years**	14 (7,200 troops) **2,769pys**	12 (7,000 troops) **2,692pys**	23 (7,000 down to 5,500[3 4]) **2,586pys**	15 (5,500 troops) **1,058 pys**	3 (5,000 troops) **962 pys**	33**[F] (4,500 troops) **1,726pys**	6[JW] (up to 5,250 troops) **2,014pys**	15 (5,250 to 6K to 6,900[56]) **2,186pys**	22[FFFA] (6,900 troops) **2,654pys**
Canada (estimated deployment) **& person-years**	**No deployment**					17[F] (2,250 troops) **865pys**	12 (2,250 troops) **865pys**	16 (2,500 troops) **962pys**	11 (2,500 troops) **962pys**
Other	5	8	4	1	4	13	4	15	23[??]
Estimated fatality rates per 1,000 personnel-years (95% Poisson uncertainty)									
US	5.0 (4.4 to 5.6)	7.5 (6.8 to 8.2)	7.3 (6.6 to 8.0)	5.7[8] (5.5[9]) (4.9 to 6.6[8]) (4.7 to 6.3[9])	3.7 (3.0 to 4.4[8])	**US troop numbers not ascertained**			
UK	4.8 (3.1 to 7.0)		8.8 (5.6 to13.3)	14.1 (7.9 to 23.4)	3.1 (0.6 to 9.1)	19** (13 to 27)	3 (1 to 6)	7 (4 to 11)	8 (5 to 13)
Canada	**No deployment**					20 (11 to 31)	14 (7 to 24)	17 (9 to 27)	11 (6 to 20)
UK/Canada	**Not applicable**					19** (14 to 25)	6 (4 to 11)	10 (7 to 14)	9 (6 to 13)

* Now shown as 437 and as 491 respectively on icasualties.org.

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

*** Includes a large cluster of eight US deaths

**** Includes large cluster of 14 US non-hostile deaths in helicopter crash in first half of PERIOD 4 (when 43/193 US fatalities in Iraq were non-hostile deaths) and 8 US non-hostile deaths in vehicle roll-over in second half of PERIOD 4 *(when 36/123 US fatalities in Iraq were non-hostile deaths)*

F = friendly fire; JW = death of Jonathan Wigley from hostile fire, but questions raised;

?? = friendly fire mooted as cause of two Danish deaths in a firefight in September 2007

A: 13/22 UK and 10/11 Canadian fatalities occurred in the first half of PERIOD 4.

TABLE 1b: Coalition military deaths and estimated fatality rates per 1,000 personnel-years in consecutive PERIODS; friendly fire deaths superscripted [F]

Theatre	***Iraq***				***Afghanistan***			
PERIODS of 140 days	*12 Nov. 2007 to 30 Mar. 2008*	*31 Mar. 2008 to 17 Aug. 2008*			*12 Nov. 2007 to 30 Mar. 2008*	*31 Mar. 2008 to 17 Aug. 2008*		
Total fatalities *(non-hostile, see footnotes)*	156 *(29)*				59[FF] *(10)*			
US (estimated deployment) **& person-years**	151 (155,000 troops) **59,615pys**				25 (31,000 troops) **11,923pys**			
UK (estimated deployment) **& person-years**	5 (~ 4,500 troops in 2007; 4,000 in 2008) **1,603pys**				8 (7,000 troops) **2,692pys**			
Canada (estimated deployment) **& person-years**	**No deployment**				10 (2,500 troops) **962pys**			
Other	0				16[FF]			
Estimated fatality rates per 1,000 personnel-years (95% Poisson uncertainty)								
US	2.5 (2.1 to 2.9)				2.1 (1.3 to 2.9)	**US troop numbers not ascertained**		
UK	3.1 (1.6 – 5.2)				3.0 (1.3 to 5.9)			
Canada	**No deployment**				10 (5 to 19)			
UK/Canada	**Not applicable**				4.9 (2.9 to 7.8)			

In Afghanistan in PERIODS 1+2+3+4 (560 days), there were 56 Canadian deaths in 3,654 pys despite Canada's deployment being *at most* half the UK's so that Canadian losses[15] have been onerously high 15 per 1,000 personnel-years (95% CI: 11 to 19). The same phenomenon persisted into PERIOD 5, see **TABLE 1b** when there were 10 Canadian deaths in 962 pys (95% CI: 5 to 19 per 1,000 pys).

In Afghanistan in PERIOD 5, UK's military fatality rate fell to 3 per 1,000 personnel-years (95% CI: 1to 6, based on 8 deaths in 2,692 pys). We do not provide PERIOD-specific fatality rates for US troops in Afghanistan because, until PERIOD 5, we have not

been able to track the numbers of US troops deployed. However, in PERIOD 5, deployment was said to be 31,000[12-14]. Thus, **Table 1b** shows the US fatality rate in Afghanistan in PERIOD 5 as 2.1 per 1,000 pys (95% CI: 1.3 to 2.9) and so consistent with the US rate in Iraq in the same PERIOD. US personnel accounted for 49% of all military fatalities in Afghanistan in PERIODS 1+2+3+4 (180/367, 95% CI: 44% to 54%) and similarly in PERIOD 5 at 45% (25/59; 95% CI: 30% to 55%).

TABLE 1a shows that, in PERIODS 1+2+3+4, non-hostile causes accounted for one in seven military deaths in Iraq (209/1543, 95% CI: 12% to 15%) but for a much higher proportion, 24%, of military fatalities in Afghanistan (88/367, 95% CI: 20% to 28%). In PERIOD 5, these proportions were consistent at 19% (29/156) and 17% (10/59) respectively.

3.2 Fatal IED (only) incidents: variation in frequency of incidents and in fatalities per fatal IED incident

TABLE 2a shows military fatalities in IED (only) incidents in Iraq and Afghanistan.

In Iraq[1], 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 but reverted in PERIOD 4 and fell dramatically to 0.3 fatal IED incidents per day in PERIOD 5.

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 (to mean of 1.8 deaths per fatal IED incident).

> 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, $p \sim 0.05$.

Unusually 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. In the first half of PERIOD 4, another such incident occurred in Afghanistan, when six Canadian lives were lost an IED attack and **Table 2b** shows one such incident in Iraq in PERIOD 5 when, trickily, six US lives were lost in a house-borne IED incident.

Noteworthy in **TABLE 2a+b** are the striking changes in fatal IED (only) incident rate, and fatalities, between PERIODS 3 and 4+5. In Afghanistan, the number of fatal IED incidents roughly doubled (up from 12 in PERIOD 3 to 27 in PERIOD 4, $p < 0.02$; with 29 having occurred in PERIOD 5) whereas, in Iraq, the number of fatal IED incidents reduced from 155 in PERIOD 3 to 86 in PERIOD 4 ($p < 0.001$) with a further major reduction to 48 in PERIOD 5. PERIOD-specific lethality per fatal IED incident in 2007/08 was similar in Iraq and Afghanistan: 1.8 in PERIOD 3, 1.6 in PERIOD 4, and 1.6 (Iraq) and 1.3 (Afghanistan) in PERIOD 5. In PERIODS 4+5 in Iraq, mean number of

deaths per fatal IED incident had reverted to the fatality rate which pertained during 1 January 2006 to 4 February 2007 from their higher lethality (1.8) in PERIOD 3.

TABLE 2a: IED fatalities in Iraq and Afghanistan

Theatre	*Fatal IED incidents in Iraq*					*In Afghanistan*		
PERIOD **Number of deaths in a fatal IED incident**	**BASE LINE:** 1 Jan. to 17 Sept. 2006 (271 IED deaths in 183 fatal IED incidents in 260 days)	Period 2: 18 Sept. 2006 to 4 Feb. 2007 (217 IED deaths in 135 fatal IED incidents in 140 days)	**BASE LINE + Period 2 POOLED** (488 IED deaths in 318 fatal IED incidents in 400days)	Period 3: 5 Feb. to 24 June 2007 **{POOLED-expectation}** (280 IED deaths in 155 fatal IED incidents in 140 days)	Period 4: 25 June to 11 Nov2007 **{POOLED-expectation}** (136 IED deaths in 86 fatal IED incidents in 140 days)	**76 IED deaths in 46 fatal IED incidents from 1 Oct. 2001 to 4 Feb. 2007** (1,953 days)	Period 3: 22 IED deaths in 12 fatal IED incidents from 5 Feb. to 24 June 2007, (140 days)	Period 4: 44 IED deaths in 27 fatal IED incidents from 25 June to 2 Sept 2007, (140 days)
1	128	88	**216**	97 **{105.3}**	57 **{ 58.4}**	**28**	8	19
2	33	23	**56**	22 **{ 27.3}**	13 **{ 15.1}**	**11**	1	3
3	14	14	**28**	20 **{ 13.6}**	12 **{ 7.6}**	**2**	2	3
4	5	9	**14**	10 **{ 8.8}**	3 **{ 4.9}**	**5**	0	1
5	3	1	**4**	1	1		0	0
6+				5			1	1
TOTAL	183	135	**318**	155	86	**46**	12	27
Fatal IED incidents per day	*0.7*	*1.0*	***0.8***	*1.1*	*0.6*	***0.02***	*0.1*	*0.2*
Mean deaths per fatal IED incident	*1.5*	*1.6*	***1.5***	*1.8*	*1.6*	***1.7***	*1.8*	*1.6*

TABLE 2b: IED fatalities in Iraq and Afghanistan

Theatre	*Fatal IED incidents in Iraq*				*In Afghanistan*			
PERIOD **Number of deaths in a fatal IED incident**	**5** 12 Nov. 2007 to 31 Mar. 2008 (78 IED deaths in 48 fatal IED incidents in 140 days)	**6** 31 Mar. to 17 Aug. 2008			**5** 12 Nov. 2007 to 31 Mar. 2008 (37 IED deaths in 29 fatal IED incidents in 140 days)	**6** 31 Mar. to 17 Aug. 2008		
1	35				22			
2	4				6			
3	4				1			
4	3							
5	1							
6+	1							
TOTAL	47				29			
Fatal IED incidents per day	*0.3*				*0.2*			
Mean deaths per fatal IED incident	*1.6*				*1.3*			

3.3 Weekday variation in Iraq's fatal IED (only) incidents, and in fatalities conditional on lethality in fatal IED incidents: comparison of PERIODS 2+3 and PERIODS 4+5
Initially, we focused on PERIODS 2+3 because, as shown above, fatal IED (only) incident rate and/or IED incidents' lethality had increased compared to BASELINE. Results were not widely disseminated - being sensitive in the view of military intelligence because US actions were underway, we assumed, to address the weekday patterning that had characterised PERIODS 2+3. The weekday pattern duly altered by PERIODS 4+5.

Essential data on 290 fatal IED (only) incidents in PERIODS 2+3 (and 497 deaths) are summarised in **TABLE 3** by weekday of incident. In these 40 weeks, the expected number of fatal IED (only) incidents per day of the week was 41.1, roughly one a day. In PERIODS 2+3, there was evidence of heterogeneity in the number of fatal IED incidents by weekday ($\chi^2 = 13.4$ on 6 degrees of freedom, $p < 0.05$): Saturdays (60) were associated with disproportionately many fatal IED incidents and Tuesdays (29) with fewer than expected (41.4). By contrast, in PERIODS 4+5, the expected number of fatal IED (only) incidents per day of the week (40 Mondays, 40 Tuesdays, etc) had halved to 19.1, roughly one per two days. In PERIODS 4+5, the observed numbers of fatal IED incidents by weekday were consistent with only random variation from expectation of 19.1 ($\chi^2 = 8.2$ on 6 degrees of freedom, $p > 0.10$).

In PERIODS 2+3, actual IED fatalities by weekday were consistent ($\chi^2 = 10.5$ on 6 degrees of freedom, $p > 0.10$) with **EXPECTED fatalities** when the latter were calculated **conditional on** a) PERIOD-specific number of fatal IED incidents that had occurred on each weekday and b) IED-lethality in that PERIOD, see **TABLE 3**. Consistency with expected fatalities was also evident in PERIODS 4+5 ($\chi^2 = 5.5$ on 6 degrees of freedom, $p > > 0.10$).

TABLE 3: Fatal IED (only) incidents and related fatalities - by weekday of IED incident.

PERIOD	Fatal IED incidents, **related fatalities**							
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	**TOTAL**
Period 2	16, **31**	15, **20**	15, **28**	17, **27**	17, **19**	28, **50**	27, **42**	135, **217** (lethality = **1.6**)
Period 3	22, **51**	14, **23**	22, **39**	27, **50**	21, **28**	32, **57**	17, **32**	155, **280** (lethality = **1.8**)
PERIODS 2+3								
Incidents *(Expect 41.4)*	38	29	37	44	38	60	44	290
Fatalities **EXPECTED Fatalities given** a) PERIOD-specific lethality per fatal IED incident applied to b) weekday-specific number of fatal IED incidents	**82** 25.72 + 39.74 = **65.46**	**43** 24.11 + 25.29 = **49.40**	**67** 24.11 + 39.74 = **63.85**	**77** 27.33 + 48.77 = **76.10**	**47** 27.33 + 37.94 = **65.27**	**107** 45.01 + 57.81 = **102.82**	**74** 43.40 + 30.71 = **74.11**	**497**
PERIOD	Fatal IED incidents, **related fatalities**							
Period 4	7, **17**	14, **25**	16, **19**	19, **30**	15, **25**	10, **15**	5, **5**	86, **136**
Period 5	4, **11**	7, **14**	8, **15**	5, **5**	6, **9**	10, **13**	8, **11**	48, **78**
PERIODS 4+5								
Incidents *(Expect 19.1)*	11	21	24	24	21	20	13	134 (lethality = **1.6**)
Fatalities **EXPECTED Fatalities given** PERIOD 4+5 lethality applied to weekday-number of fatal IED incidents	**28** **17.57**	**39** **33.54**	**34** **38.33**	**35** **38.33**	**34** **33.54**	**28** **31.94**	**16** **20.76**	**214**

4. DISCUSSION

4.1 Afghanistan versus Iraq: dicing with death

Canada's high military fatality rate throughout PERIODS 1+2+3+4 of 15 deaths per 1,000 personnel-years (95% CI: 11 to 19) in Afghanistan warranted close scrutiny. In PERIOD 5, Canadian fatalities were again high at 10 in 962 personnel-years (95% CI: 5 to 19 per 1,000 pys).

In the most recent epochs, UK troops have encountered similarly lethal hostilities in both theatres of operation (Afghanistan and Iraq). Their common fatality rate was 9 UK deaths per 1,000 personnel-years (95% CI: 7 - 11) in PERIOD 3 and first half of PERIOD 4 (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). In PERIOD 5, during which Prince Harry served in Afghanistan and throughout which UK troops had withdrawn from Basra City, military fatality rate had reduced to 3 UK deaths per 1,000 personnel-years (95% CI: 1.6 to 5.2).

The US military fatality rate of 7 deaths per 1,000 personnel-years, which had been sustained from PERIOD 2 into PERIOD 3, despite a surge of 20,000 to 30,000 additional US troops, fell very significantly in the first half of PERIOD 4 to 5.7 per 1,000 personnel-years (95% CI: 4.9 to 6.6) or less[11], and fell further still in the second half of PERIOD 4 to 3.7 per 1,000 personnel-years (95% CI: 3.0 to 4.4) and a forteriori to 2.5 per 1,000 personnel-years (95% CI: 2.1 to 2.9) in PERIOD 5.

4.2 Increased lethality and frequency of IEDs in Iraq reverts, but not in Afghanistan; and weekday patterns

Bird and Fariweather[1] 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 occurred. Their lethality 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 – six such incidents in Iraq, and two in Afghanistan to the end of PERIOD 5.

In PERIOD 4, the frequency and lethality of fatal IED (only) incidents in Iraq reverted to the lower levels of a year previously but, in Afghanistan, frequency at least doubled: 27 fatal IED incidents (and 44 fatalities) in PERIOD 4 compared with 12 (and 22 fatalities) in PERIOD 3. In PERIOD 5, fatal IED incidents in Iraq reduced dramatically to as few as 48 (and 78 fatalities) but the PERIOD 4 increase in Afghanistan persisted into PERIOD 5 when 29 fatal IED incidents claimed 37 lives.

Substantial reduction (by at least two-thirds) in the frequency of fatal IED incidents in Iraq between PERIODS 3 and 5 was matched by a doubling in frequency in Afghanistan. PERIOD-specific similar lethality in fatal IED incidents can be seen as empirical

endorsement of military concerns that a common source for IEDs may servicing both theatres of operation.

Besides major reduction in the weekday-expected number of incidents from 41.4 (PERIODS 2+3) to 19.1 (PERIODS 4+5) per 40 weeks, the successful disruption in PERIODS 4+5 of a previous weekday pattern to fatal IED incidents in Iraq in PERIODS 2+3 suggests that US military intelligence may have introduced effective counter-measures, or that insurgents changed tactics.

4.4 Projection of UK military fatalities in PERIOD 6

On the basis of 1,500 and 3,000 personnel-years respectively in Iraq and Afghanistan, we had expected around 30 UK fatalities (5.25+24) in PERIOD 5 as singleton deaths or in small clusters - but with wide, informal uncertainty range from 15 to 45. Relatively few deaths in Afghanistan during the winter's counter-insurgency campaign mean thankfully that out-turn was at the lower end of our expectations. As Afghanistan emerges from its winter, PERIOD 6 may be less auspicious, but – as in PERIOD 5 - low numbers of UK military deaths are expected in Iraq given the UK troop withdrawal from Basra City. Our range of expectations for PERIOD 6 is much as it had been for PERIOD 5.

References

1. Bird SM, Fairweather CB. Military fatality rates (by cause) in Afghanistan and Iraq: a measure of hostilities. *International Journal of Epidemiology* 2007 (advanced access published online on 21 May 2007, doi:10.1093/iej/dym103).
2. Bird SM. UK Statistical indifference to its military casualties in Iraq. *Lancet* 2006; 367: 713 – 715.
3. McGinty S. Their sacrifice is not in vain. *Scotsman* 2008; 1 April.
4. Defence Factsheet Operations in Iraq: Key Facts and Figures (http://www.mod.uk/DefenceInternet/FactSheets/OperationsFactsheets/OperationsInIraqKeyFactsFigures.htm; accessed 3 July 2007).
5. Colvin R. UK's next PM on fact-finding visit to Iraq. (http://www.boston.com/news/world/europe/articles/2007/06/11/uks_brown_makes_fact_finding_visit_to_iraq/; accessed on 3 July 2007).
6. Norton-Taylor R. Brown to make deep cuts in troop numbers and offer asylum deal. *Guardian* 2007: 8 October (http://www.guardian.co.uk/politics/2007/0ct/08/immigration.iraq; accessed 3 April 2008).
7. Holt R. Gordon Brown to cut UK Iraq force to 2,500. *Telegraph* 2007; 8 October (http://www.telegraph.co.uk/news/main.jhtml?xml=/bews/2007/10/08; accessed 3 April 2008).
8. Lydall R. Iraq violence puts pull-out of 1,500 UK troops in doubt. *Scotsman* 2008; March 20.
9. Defence Factsheet Operations in Afghanistan: British Forces (http://www.mod.uk/DefenceInternet/FactSheets/OperationsFactsheets/OperationsInAfghanistanBritishForces.htm; accessed on 3 July 2007).

10. Mumtaz R. UK's incoming PM Brown opts to battle for hearts and minds: report (http://www.pakistantimes.net/2007/05/31/top4.htm; accessed on 3 July 2007).
11. Anonymous at AFT. Despite hints of force cuts, Bush not saying when troops will come home. (http://afp.google.com/article/ALeqM5gul8fDiSEXA0o7mPTvETX0aS3piA; accessed on 4 September 2007).
12. Goldenberg S. Petraeus to claim surge success and resist calls for early withdrawal. *Guardian* 2007; 8 September: 29.
13. Martig N. Gates says Iraq troop withdrawals will probably continue. (http://www.voanews.com/tibetan/archive/2008-02/2008-02-22-voa4.cfm; accessed 3 April 2008).
14. Goldenberg S. Bush pledges more troops to Afghanistan despite focus on Iraq. *Guardian* 2008; 5 April: 22.
15. Mason C. Canada wrestles over troop deployment in Afghanistan. (http://www.iht.com/articles/2007/04/22/news/canada.php; accessed on 3 July 2007).