



Historical analysis of urban combat casualties and loss rates

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- Introduction and background
- Review of urban casualty and loss studies
- Building new urban and rural data sets
- Comparing urban and rural battles
- The results in context
- Conclusions
- Questions?



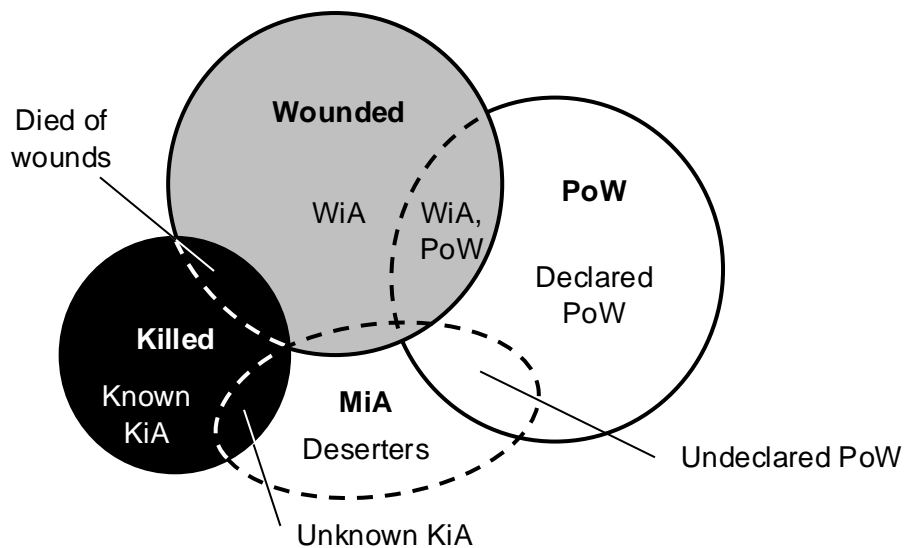
- Dstl supports the OR Branch of HQ ARRC
 - including planning data, wargames, and staff exercises
- Recent exercises have a significant urban (FIBUA/MOUT) component
 - routinely include medical logistic planning
 - recognised that expected casualty rate data are old
 - FIBUA data in particular were derived from WW2 analysis
- All quantitative FIBUA casualty analysis dates from 1980s–2000s
 - DOAC (UK) and TDI (US) exclusively using WW2 data ...
 - is the analysis still valid?
- Robustness: can counter-intuitive conclusions be repeated?
 - Value in confirming previous analysis independently

- UK WW2 HA from the 1980s showed attacking was *easier* in FIBUA
 - attack took fewer losses, defence took more
 - difference approximately a factor of two in LER
 - but urban battles took longer: rubble, and shorter tactical bounds
- Urban defenders took more losses as PoWs
- US (TDI) HA in 2002 confirmed UK result
 - again using WW2 data – attacking is easier into urban terrain
- UK studies appeared to show differences in W:K ratios ...
 - but confounded by P(win) effects; needs further investigation
- Historical DoW statistics collected, showing gradual improvements

- Customer focus at brigade level (US regiment in WW2) and below
 - also, ‘pure’ urban battles only tend to happen at lower levels
- Started with Helmbold database (1991) and Goodman & Young (1996)
 - insufficient urban battles post-WW2 particularly
 - and needed a comparable sample of rural battles
 - for forces in attack and defence
 - matched for combat echelons
- Researched 213 military forces fighting in 145 unique battles
 - 43 urban battles, 102 rural
 - from 1943 to 2008

- Assembled data on 47 unique WW2 battles
 - 22 urban, 25 rural
- Assembled data on 98 unique post-WW2 battles
 - 21 urban, 77 rural
- Mostly from NW Europe and Middle-East
 - avoided WW2 Far East and Pacific theatres
 - Canadian battle of Ortona (in Italy, 1943) yielded four good data points
 - one at brigade, two at battalion, one at company
- Data quality and cleaning were key to analysis
 - reliable casualty and loss data often available for one side only
 - previous HA studies did not document their data fully

- Losses split into killed, wounded, and prisoners of war (PoWs)
 - a simplification driven by data availability (or lack of ...)



- Urban battles take longer than their rural equivalents
 - but great variability, reflecting different forces and circumstances
 - durations in whole days

Terrain:	Urban					Rural				
	<i>n</i>	<i>Mean</i>	<i>25%</i>	<i>50%</i>	<i>75%</i>	<i>n</i>	<i>Mean</i>	<i>25%</i>	<i>50%</i>	<i>75%</i>
Brigade	18	6.8	2.3	5.0	7.8	67	2.9	1.0	2.0	3.0
Battalion	19	4.2	1.0	2.0	5.5	14	1.4	1.0	1.0	1.0
Company	6	1.2	1.0	1.0	1.0	21	1.0	1.0	1.0	1.0

- Very similar to previous DOAE (UK) and TDI (US) findings
 - using different data sets

- Probability of attacker winning in urban and rural terrains
 - with a draw counting as 0.5

Terrain	Sample	Wins	Draws	Losses	P(Awin)
Urban (all)	43	35	6	2	88.4%
Rural (all)	102	55	10	37	58.8%

- Findings highly statistically significant (0.1% level, Chi-squared test)
- Confirms previous UK and US conclusions
 - again, using different data sets
- Statistically significant for WW2 and post-WW2 data taken separately
 - a new result

- Expected daily loss rates drive medical planning assumptions
 - greatly affected by $P(\text{win})$ and command level or echelon
 - as command level increases, proportion of forces engaged decreases

- Brigade example:

Terrain and posture	Sample	Mean	25%-ile	Median	75%-ile
Urban attacks	18	3.8%	0.3%	1.5%	2.2%
Rural attacks	34	7.6%	2.4%	3.6%	10.8%
Urban defences	9	7.0%	2.3%	7.2%	11.1%
Rural defences	60	9.1%	2.5%	4.6%	10.4%

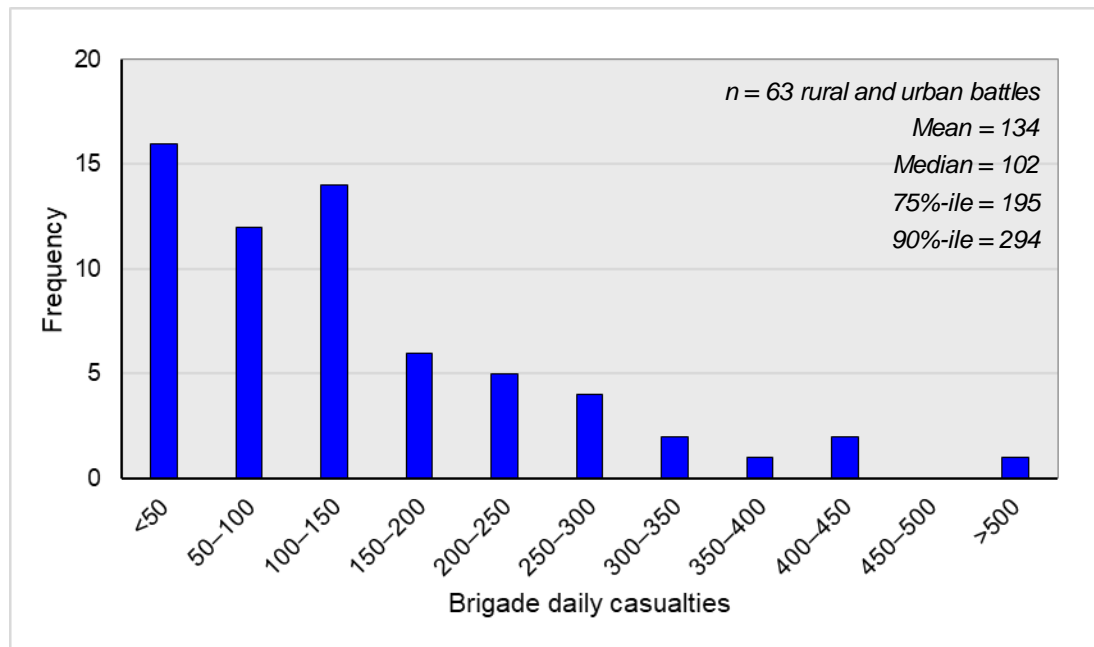
- Losses (unsurprisingly) much higher for losers
 - rates do not appear to have changed much since WW2

- Wounded-to-killed (W:K) ratios for urban and rural battles

Terrain and posture	Sample	Mean	25%-ile	Median	75%-ile
Urban attacks	38	4.39	2.00	3.03	5.37
Rural attacks	61	2.37	1.99	2.02	3.00
Urban defences	21	1.49	1.00	1.50	2.00
Rural defences	93	2.25	1.53	2.00	3.00

- Reflects fact that $P(\text{win})$ differs between terrains
 - W:K ratios are always better for the winning force
 - W:K ratios are usually better for the attacker, as they own the ground
- W:K ratios for attackers have improved since WW2

- Daily combat losses at brigade command level
 - across all scenarios, because medical logs must cope with all cases



- Highly skewed distribution
 - \approx log-normal
- No 'optimum' capacity
- A military choice

- For urban defenders a median of 32% of losses were PoWs
 - compared with 8% for rural defenders
- Largely due to defenders losing more often in urban
 - also probably affected by terrain
 - harder to withdraw
 - easier to become isolated in urban
- Winners are usually responsible for wounded PoWs ...
 - but as winners, are likely to have fewer friendly WiAs to treat
 - thus unlikely to raise average demand for medical service capacity

- Controlling for command level is important in HA
 - particularly in predicting casualty rate trends
 - split results by winning and losing ... not done by previous UK and US HA
- FIBUA characteristics have not changed greatly since WW2
 - and may not change radically in the future
- Casualty treatment capacity is a military choice ... no OR 'optimum'
 - scaled for Blue force size; Red and White casualties unlikely to affect this
- Implications for UK FIBUA doctrine and training
 - UK FIBUA training infrastructure needs review
 - more wargaming needed for training ... as long as rules are realistic!

- Urban battles last longer, on average, than their rural equivalents
- Urban terrain favours the attacker
 - modern attackers typically sustain W:K ratios of 3.0–5.0
 - modern defenders typically sustain W:K ratios of 2.0–3.0
- Attackers unlikely to sustain PoW losses, defenders 20–50% as PoWs
- Casualty rate distributions are highly skewed, \approx log-normal curve
- Casualty and loss patterns have not changed greatly since WW2
 - validating and extending previous OR
- UK forces should not seek to avoid attacking into urban areas

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Questions?



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