

## Health Data from Operation Resolute (Bosnia). Part 1: Primary Care Data

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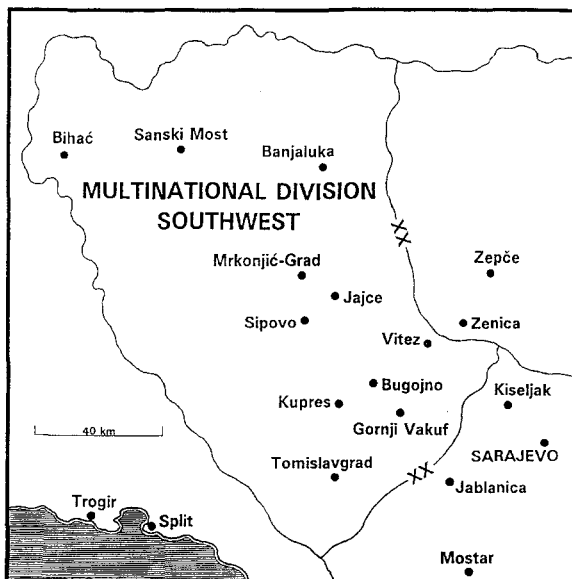
**SUMMARY:** This paper describes routine sickness events occurring during Weeks 1-19 of Operation Resolute (Bosnia). The period covered is 20 December 1995 to 28 April 1996. Primary care data were collected and analysed through an HQ ARRC epidemiological surveillance system which encompassed all British personnel in theatre. There was a total of 17,054 primary care consultations in the British force, which at its peak in late January numbered 10,832 personnel. 11,472 of these consultations were due to disease (67% of the total) and 5568 to non-battle injury (32% of the total). The observed rate of sickness due to disease was close to the predicted rate, which was 1.35% of the force per day. The observed rate of sickness due to non-battle injury was between 6 and 10 times higher than the predicted rate of 0.05% of the force per day. There were only 14 primary care consultations due to battle injury.

### Introduction

British troops first deployed to Bosnia in November 1992 in the Operation Grapple series of peacekeeping operations, carried out under UN mandate. Intense US diplomacy during September 1995 resulted in a negotiated ceasefire. On 15 December 1995 the Dayton peace agreement was signed in Paris by representatives from all the warring factions in the Former Yugoslavian Republic of Bosnia-Herzegovina. On D-Day, 20 December 1995, there was a formal transfer of peacekeeping authority from the UN to NATO. This date marked the start of Operation Resolute.

Britain undertook to play a major part in the new peace process and to contribute in excess of 10,000 troops to the NATO-led peace implementation force, to be known as IFOR. The majority of these British troops were to be deployed within the area of operations (AO) of the Multinational Division Southwest, with its headquarters at Gornji Vakuf. The logistic support elements of the division were concentrated in the divisional rear area in and around Split. In addition, Britain was the "framework nation" in the theatre headquarters locations at Sarajevo and Kiseljak of the ACE (Allied Command Europe) Rapid Reaction Corps, or ARRC. There were thus three distinct British troop populations at all stages of Operation Resolute, each population experiencing different health hazards. Figure 1 shows the principal British locations during the early stages of the operation.

British medical assets in theatre consisted initially of 22 Field Hospital at Tomislavgrad, medical support troops at Sipovo and Gornji Vakuf (known respectively as MST1 and MST2), a field surgical team at Sarajevo, and 1 Aeromed/3 Casevac Squadrons at Divulje Barracks, Split. A total of 23 primary health care treatment facilities served British troops,



**Fig 1. British troops locations in Bosnia-Herzegovina during Operation Resolute. Multinational Division Southwest is the British-led IFOR division.**

with 2 Armoured Field Ambulance and 5 Field Ambulance providing support to primary care and ground evacuation resources. The nature of the terrain in Bosnia-Herzegovina, the harsh weather conditions in the first four months of the operation, and the nature of troop dispersal required an area medical matrix to be established. Thus the principles of medical care and evacuation were more akin to the NHS,

with primary care referrals being transported directly to hospital, rather than through the lines of evacuation accepted as normal for conventional war operations.

This paper describes the routine sickness attendances at primary care level which took place during the first 19 weeks of Operation Resolute.

### Methods

Prior to the establishment in May 1996 of an experimental surveillance system ("J95"), an interim statistical return was introduced on D-Day. This required the daily notification by primary health care facilities of the numbers of consultations occurring under 16 major sickness groupings, as follows:

#### Disease

1. Respiratory illness
2. Enteric disease
3. Skin disease
4. Gynaecological disorders
5. Sexually-transmitted disease
6. Ectoparasites
7. Dental disorders
8. Alcohol/drug dependency
9. Other psychiatric illness
10. Other disease

#### Non-battle injury (NBI)

11. Injury due to road traffic accident (RTA)
12. Occupational injury (non-RTA)
13. Cold injury
14. Sports injury
15. Other injury (non-battle)

#### Battle injury

16. Battle injury (all types)

The same HQ ARRC daily return was used to collect limited data on hospital admissions, military fatalities, the treatment of non-military personnel, and resource utilisation.

The return was submitted nightly to the medical cell at the divisional headquarters at Gornji Vakuf, normally through radio link or fax. Analysis was carried out with the Army's SLIM for Windows (SFW) package, which is based on a modified Windows for Workgroups 3.11 platform, using MS Office Professional 4.3 automation software (I). SFW is currently the only IT package which is approved for use on British military operations.

100% coverage of all British medical facilities in theatre was achieved from D-Day onwards. Any gaps in sickness data reporting were followed up by personal phone call, fax, radio message, letter or signal. Precise population data were obtained from central staff branches, and were re-calculated daily. From the start of the operation, therefore, numerator data were complete and denominators were correct to the nearest man in theatre.

### Results

Between Weeks 1-19 of Operation Resolute 17,054 primary care consultations took place in British medical facilities. The breakdown of these consultations according to the three principal military groupings where they occurred is given in Table 1. Table 2 shows the relative populations of these three groupings as they changed over time.

In all, there were 11,472 consultations for disease (67% of the total) during this early phase of Operation Resolute. There were 5568 consultations for non-battle injury (32% o

**Table 1**  
**Primary care consultations in main British Military Groupings during Operation Resolute (Bosnia) Weeks 1-19**

Code	Diagnostic group	Div AO	HQ ARRC Group	Div Rear	Totals (%)
1	Respiratory illness	2208	904	1429	4541 (26.6)
2	Enteric disease	492	398	249	1139 (6.7)
3	Skin disease	1122	447	603	2172 (12.7)
4	Gynaecological disorders	52	41	96	189 (1.1)
5	Sexually-transmitted disease	97	16	85	198 (1.2)
6	Ectoparasites	32	8	14	54 (0.3)
7	Dental disorders	798	192	310	1300 (7.6)
8	Alcohol/drug dependency	10	1	2	13 (0.1)
9	Other psychiatric illness	74	7	65	146 (0.9)
10	Other disease	781	286	653	1720 (10.0)
11	Injury due to RTA	137	30	65	232 (1.4)
12	Occupational injury (non-RTA)	783	466	433	1682 (9.9)
13	Cold injury	98	22	35	155 (0.9)
14	Sports injury	289	89	248	626 (3.7)
15	Other injury (non-battle)	1729	404	740	2873 (16.8)
16	Battle injury	8	6	0	14 (0.1)
<b>Total primary care consultations</b>		<b>8710</b>	<b>3317</b>	<b>5027</b>	<b>17,054 (100)</b>

**Key:** Div AO = All MND SW locations; HQ ARRC Group = Sarajevo (i.e. HQ ARRC Main)  
Div Rear = Split and Trogir (i.e. Croatia locations) and Kiseljak (i.e. HQ ARRC Rear) locations

Table 2

## Mid-week population statistics for main British Military Groupings during Operation Resolute (Bosnia) Weeks 1-19

Week	Dates	Div AO	HQ ARRC Group	Div Rear	Total British population
1	December 20-24	3242	616	1962	5820
2	December 25-31	3573	608	3099	7280
3	January 1-7	3869	1198	2528	7595
4	January 8-14	4458	1277	2693	8428
5	January 15-21	6844	1245	2743	10,832
6	January 22-28	6813	1276	2363	10,452
7	January 29-February 4	6932	1332	2328	10,592
8	February 5-11	6850	1230	2510	10,590
9	February 12-18	6676	1194	2373	10,243
10	February 19-25	6509	1161	2284	9954
11	February 26-March 3	6392	1107	2341	9840
12	March 4-10	6442	1105	2189	9736
13	March 11-17	6262	1109	2089	9460
14	March 18-24	6097	1081	2148	9326
15	March 25-31	6124	1047	2124	9295
16	April 1-7	5995	971	2262	9228
17	April 8-14	5999	1006	2115	9120
18	April 15-21	6022	1024	2168	9214
19	April 22-28	6107	1046	2113	9266

the total) and only 14 primary care consultations due to battle injury.

Prior to the start of Operation Resolute, HQ ARRC had issued a series of "medical planning predictions" to commanders in the troop contributing nations of IFOR. These planning predictions stated that 1.35% of the force would seek medical assistance on account of disease each day, and 0.05% on account of non-battle injury. Figure 2 converts these predictions to rates per 1000 force strength. As the chart shows, the observed daily consultation rate for disease was close to the predicted rate, and fluctuated between a range of 7.3 daily disease consultation per 1000 strength (Week 14) and 19.2 daily disease consultations per 1000 strength (Week 3). The non-battle injury prediction, however, seriously underestimated the actual rate of NBI in

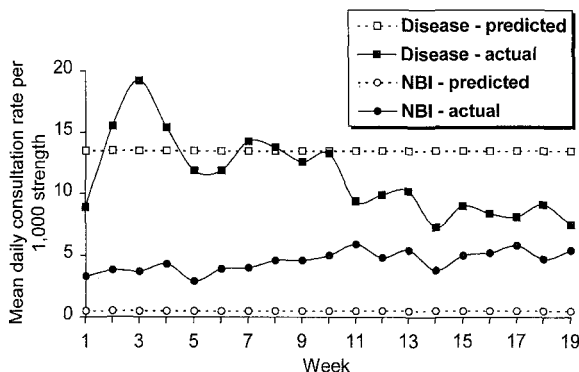


Fig 2. Operation Resolute 1995/96. Predicted and actual disease NBI rates.

British troops in theatre. This fluctuated between 2.9 daily NBI consultations per 1000 force strength (Week 5) and 5.9 daily NBI consultations per 1000 strength (Week 11). As is shown in Figure 2, the disease prediction proved to be surprisingly accurate, but the non-battle injury prediction underestimated the actual rate of NBI by a factor of around ten.

Figures 3 and 4 look more closely at morbidity associated with operational injuries. Despite the great volume of road movement which occurred during the early months of Operation Resolute, there were no RTA fatalities. However, injury due to RTAs ran at a high level in the early weeks of Operation Resolute on account of treacherous weather conditions, poor roads, and inexperienced and over-tired drivers. There is some evidence from the data that after the troop population "surge" of the first few weeks, drivers learned to manage their vehicles more safely and injuries declined.

Occupational injury, on the other hand, continued at a more constant level throughout the first 19 weeks of Operation Resolute, as is shown in Figure 4.

Figure 5 plots consultations for dental disorders against time. Dental disease was a significant primary care burden during Weeks 1-19 of Operation Resolute, notwithstanding the fact that troops notionally arrived in theatre dentally fit. The disproportionately high dental caseload which appears to have fallen to the divisional AO probably reflects easier access there to dental facilities, rather than a higher level of dental disease as such.

Figure 6 compares British consultation rates for respiratory illness in the three main military groupings. An outbreak of influenza-like illness occurred in the divisional

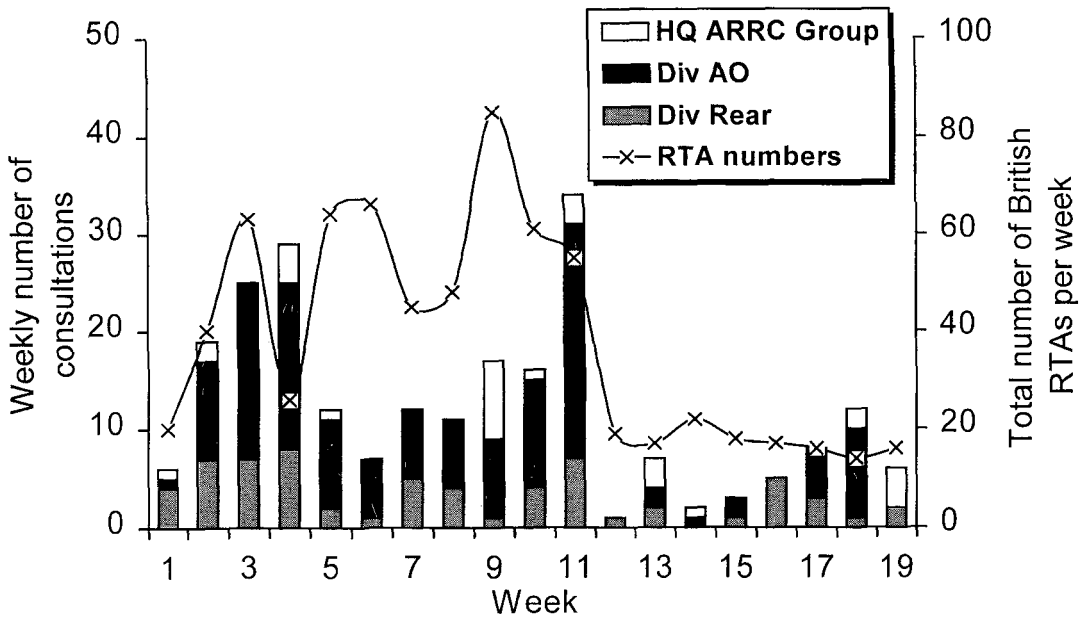


Fig 3. Operation Resolute 1995/96. Consultations for injury due to RTA.

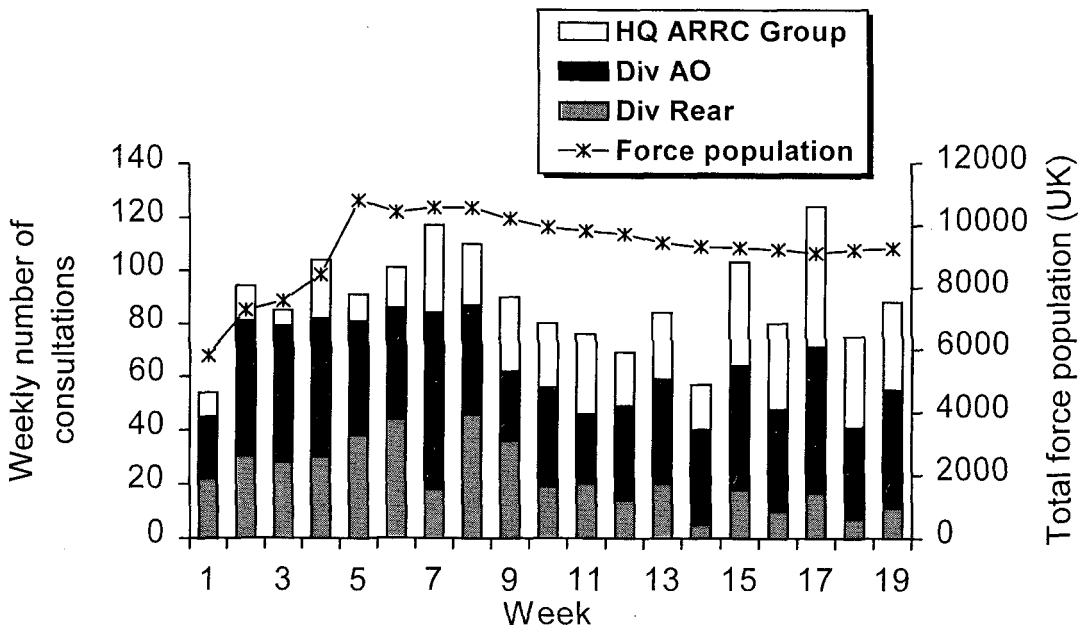


Fig 4. Operation Resolute 1995/96. Consultations for occupational injury.

rear area during Weeks 2-4, as is clearly seen in the graph. This coincided with the arrival at the Split airhead of troops coming from presumed epidemic foci in UK. It preceded a small rubella outbreak which occurred in Split in April, and again was imported from UK (2). Overall, HQ ARRC Group troops had the highest level of consultation for respiratory

illness, which reflects the exceptionally unsanitary living conditions at Zetra Stadium and other IFOR locations in and around Sarajevo.

Lastly, Figure 7 compares consultation rates over time for enteric disease. Diarrhoeal disease was the leading cause of infectious morbidity among US troops during the Gulf War

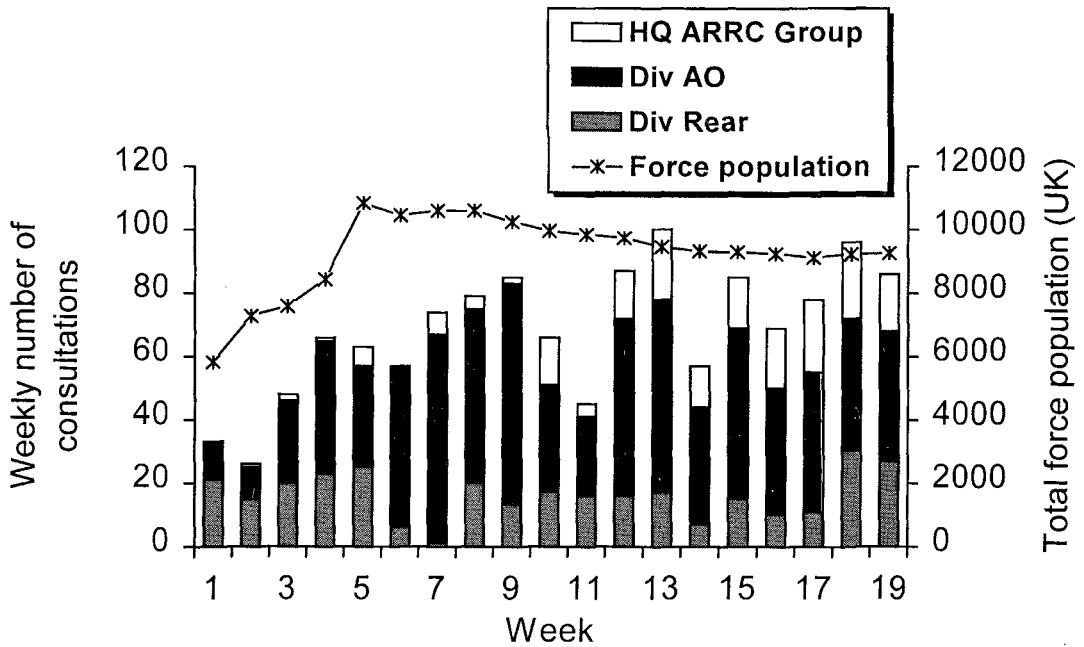


Fig 5. Operation Resolute 1995/96. Consultations for dental disorders.

(3, 4), and was expected to be a prominent feature of Operation Resolute. The graph shows clearly the explosive outbreak of gastrointestinal disease which occurred during the first weeks of HQ ARRC's arrival in theatre, and which was centred on the Hotel Dalmacija, in Kiseljak. The low levels of enteric disease which prevailed elsewhere during this phase of Operation Resolute are attributable to good food safety practices in British military kitchens, to the cold weather (which prevented the multiplication of food- and waterborne pathogens), and to the use of disposable plates, cups and cutlery in all British troop locations.

**Discussion**

The Defence Analytical Services Agency (DASA) publishes an annual compilation of every admission to a military hospital that results in a "bedded sickness episode" lasting 48 hours or more (5). In addition there exist several published accounts of disease outbreaks or other extraordinary medical occurrences in recent military campaigns (6, 7, 8). However there is a dearth of published data relating to routine primary health care events during recent military operations, and Winfield's paper (9) is possibly unique in this respect.

This lack of reliable data relating to low-level military morbidity is all the more surprising given the fact that in the planning of any military operation it is essential to be able to predict accurately the likely level of daily force attrition that will result from routine sickness. These planning predictions are an important determinant of the number of troops that will be mobilised. They also dictate the overall number, and the skill mix in that number, of uniformed healthcare

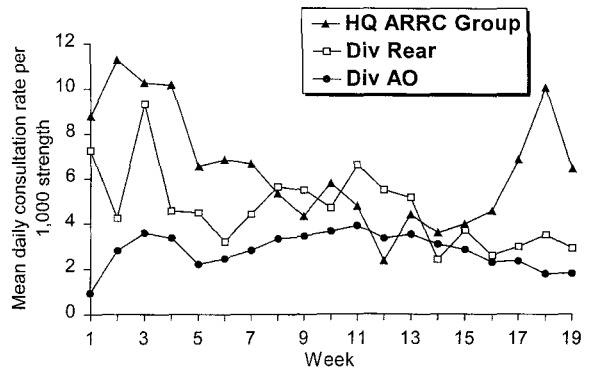


Fig 6. Operation Resolute 1995/96. Consultation rates for respiratory illness.

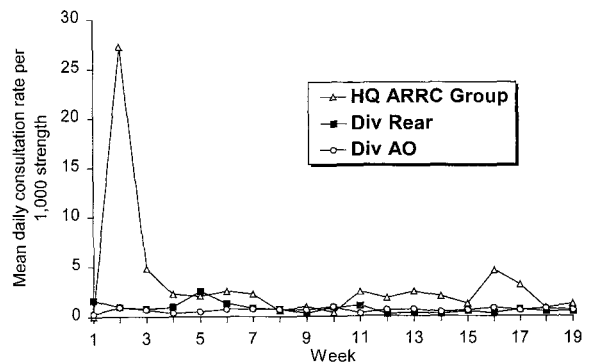


Fig 7. Operation Resolute 1995/96. Consultation rates for enteric disease.

personnel who will be required to support the operation. The fact that the ARRC planning predictions for routine NBI occurrences to be expected in Bosnia was incorrect by a factor of ten strongly suggests that these predictions were based on flawed or inappropriate data compiled from past operations. Pre-deployment health intelligence seems not to have anticipated specific injury hazards such as dog bites and sports injuries, which were common during Operation Resolute and contributed to the high injury caseload. These are analysed elsewhere (10, 11).

During the prosecution phase of a military campaign no less than in the planning phase, commanders require timely and accurate intelligence on routine sickness. This intelligence should be refreshed at least daily. The requirement is especially urgent given that military operations today are conducted under the spotlight of the news media (12). Today's press expect unrestricted access to almost every area of a theatre of war, and are swift to proclaim any real or imagined threat to the health of British troops. This phenomenon has been observed already during Operation Resolute (13, 14).

The success of this HQ ARRC data collection system shows that it is possible to devise and to implement a simple daily surveillance programme of the health of deployed troops, which is capable of providing reliable feedback within hours to commanders and to medical personnel on the ground, and to serve also as a useful planning tool for future operations. Factors which in past operations have contributed to the low visibility of primary care data include poor initial record-keeping, incomplete data capture due to the "fog of war", local difficulties with communications, shifting denominator populations, and lack of epidemiological expertise in headquarters staffs. None of these excuses should be tolerated any longer.

#### Acknowledgement

We thank all those medical, dental and nursing personnel on Operation Resolute who submitted their HQ ARRC daily statistical returns so conscientiously, often in the face of great technological difficulties.

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