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J97 as a Tool to Investigate the Effects of the Southeast Asia Smog

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SUMMARY: This paper describes the use of the J97 Health Surveillance System to monitor the effects of exposure to atmospheric pollution on the health of the Army population in Brunei. It shows that the J97 Health Surveillance tool is adaptable and can be used to rapidly set up a population-based health surveillance system.

Introduction

Health surveillance is defined as the routine, systematic collection and analysis, interpretation, and reporting of standardised, population based data for the purposes of characterising and countering threats to a population's health, well-being and performance (1). A previous paper has discussed options for the health surveillance of the British Armed Forces (2). This paper considers the problem of health surveillance for dependants of Army personnel and examines the practical application of health surveillance techniques to monitor the effectiveness of a programme to control the risk from exposure to an environmental pollutant.

During late 1997 and early 1998 the health of the UK military population and dependants resident in Brunei was threatened by a blanket of smoke that lay across South-east Asia. This smoke was the result of extensive forest fires that had arisen from the 'slash and burn' agricultural system and had not been extinguished by the normal seasonal monsoon. The assessment of this threat by an Environmental Health Advisory Team has been discussed in another paper (3). One of the principle recommendations from this assessment was the establishment of a health surveillance system for personnel exposed to the smog to measure the effectiveness of the control measures.

The British Army has developed a population-based health surveillance programme called J97 (4). This reports the outcome from primary care attendances for all British Army personnel attending military medical units using the form, F Med 95. These forms are then analysed by the Army Health Unit as an indicator of the health of the Army. Attendances are divided by diagnostic category in accordance with the ICD coding system (5). It was considered that the J97 system could be extended to dependants and used alongside the reporting system for soldiers to determine whether there was a measurable health effect from exposure to the Brunei smog.

The aim of this study was to define the baseline attendance rate by diagnostic category for dependants in Brunei and to monitor the effectiveness of control measures by observing whether the rate changed as a consequence of exposure to the Brunei Smog.

Method

There are eight distinct populations under UK military responsibility in Brunei. These are shown in Table 1. British and Gurkha troops were already the subject of health surveillance using the existing J97 system. It was impractical to undertake health surveillance of loan service personnel because this was a small population and widely dispersed. It was considered that the dependants of British Troops and UK based civilians were a homogeneous population that could be combined. UK based civilians were too small a population to study. Therefore this study recorded health surveillance data on only 2 populations, British families and Gurkha families. These populations were based in the British Garrison at Seria (Table 1).

Table 1
UK Military Populations in Brunei

British Troops
Gurkha Troops
British Loan Service Personnel
UK based civilians
Dependants of British Troops
Dependants of Gurkha Troops
Dependants of Loan Service personnel
Dependants of UK based civilians

The hazard posed by the smog in Brunei varied on a daily basis. The pathological mechanisms by which the smog might affect health were unclear. There was anecdotal evidence to suggest that the eyes and respiratory tract were most likely to be affected. There was no evidence to suggest that there had been an increase in emergency medical attendances. However there was concern that acute and semi-acute illnesses were more frequent. J97 data is usually collected on a monthly basis. This would not have been sufficiently sensitive to measure variations in health as a result of changes in the concentration of the smog. It was considered impracticable to record attendances on a daily basis but collecting attendances on a weekly basis was achievable. This would be expected to detect variation in attendance rates as a result of aggregated weekly exposure to the smog.

The study was conducted in 2 elements. The first element was to define the baseline attendance rate by retrospective extraction of attendance data from the existing records for military personnel (Gurkha and British Troops collected on a monthly basis) and from the attendance record book at the Medical Reception Station (MRS) Seria for British and Gurkha dependants. The second element was prospective data collection from the date of completion of the visit of the Environmental Health Advisory Team until the threat to health from the Brunei

smog was assessed to have passed.

It was intended that variations in weekly attendance rates would be compared with the results from environmental measurements of the smog. Unfortunately there were no reliable records of concentrations of the smog prior to the start of the study. The smog dispersed soon after the prospective element of the study was started and thus there was insufficient data for analysis.

The completed J97 data collection forms were collated at the Army Health Unit using EpiInfo software by the J97 Health Care Analyst.

Results

The mean population for each group was: military personnel 945; Gurkha families 764 and British families 214. These values were used as the denominators for calculation of incidence of attendances.

It was considered that the smog would be most likely to affect the eye, upper respiratory tract, the lungs and the skin based on the assumption that the pathological process would be either allergic or irritant. Figure 1 shows the initial attendance rate per hundred personnel per week by J97 diagnostic code for each population. Gurkha families have a higher rate of attendance than British families for eye disorders, Ear Nose and Throat (ENT) disorders and upper respiratory tract (URT) conditions. British families have a higher rate of attendance for lower respiratory tract (LRT) conditions. The large excess of attendance by Gurkha families for code 18 *"Diseases other than those categorised"* is principally due to attendance for antenatal care.

Figure 2 shows the time series graph for first attendance for each population. The most marked variation is for Gurkha families who have a higher rate of attendance from week 27 to 41 of 1997 (June to October) and week 1 to 15 of 1998 (January to April). The attendance rate for Gurkha families in this second period is substantially higher than the equivalent period in 1997. Overall military personnel have a low attendance rate compared to families.

The rate of first attendance for British families and Gurkha families was compared by a time series graph for code 081 "*upper respiratory tract conditions"* and code 321 "*dermatological conditions other than eczema"*. These are shown in Figures 3 and 4 respectively. The peak in first attendance rate for Gurkha families in week 27 to 41 of 1997 seems to be matched to the peaks of attendance for upper respiratory tract conditions in this period.

Discussion

This paper describes the use of J97 as a health surveillance tool for Army dependants as a means to measure the effectiveness of measures taken to control exposure to an environmental hazard. The Environmental Health Advisory Team visited Brunei in early April 1998. This visit made a series of recommendations which resulted in the promulgation of specific policies to reduce exposure to the smog including the purchase of air purifiers, filters for air conditioners and face masks and the voluntary repatriation of families to either UK or Nepal. The smog significantly reduced during May and June 1998 which resulted in the suspension of the surveillance programme at the end of June 1998.

This paper reports the first systematic measure of attendance rates for a military dependant population. It demonstrates that population-based health surveillance can be performed on this population and reinforces other work on the use of the same health surveillance tool for military personnel (4,5). Figure 1

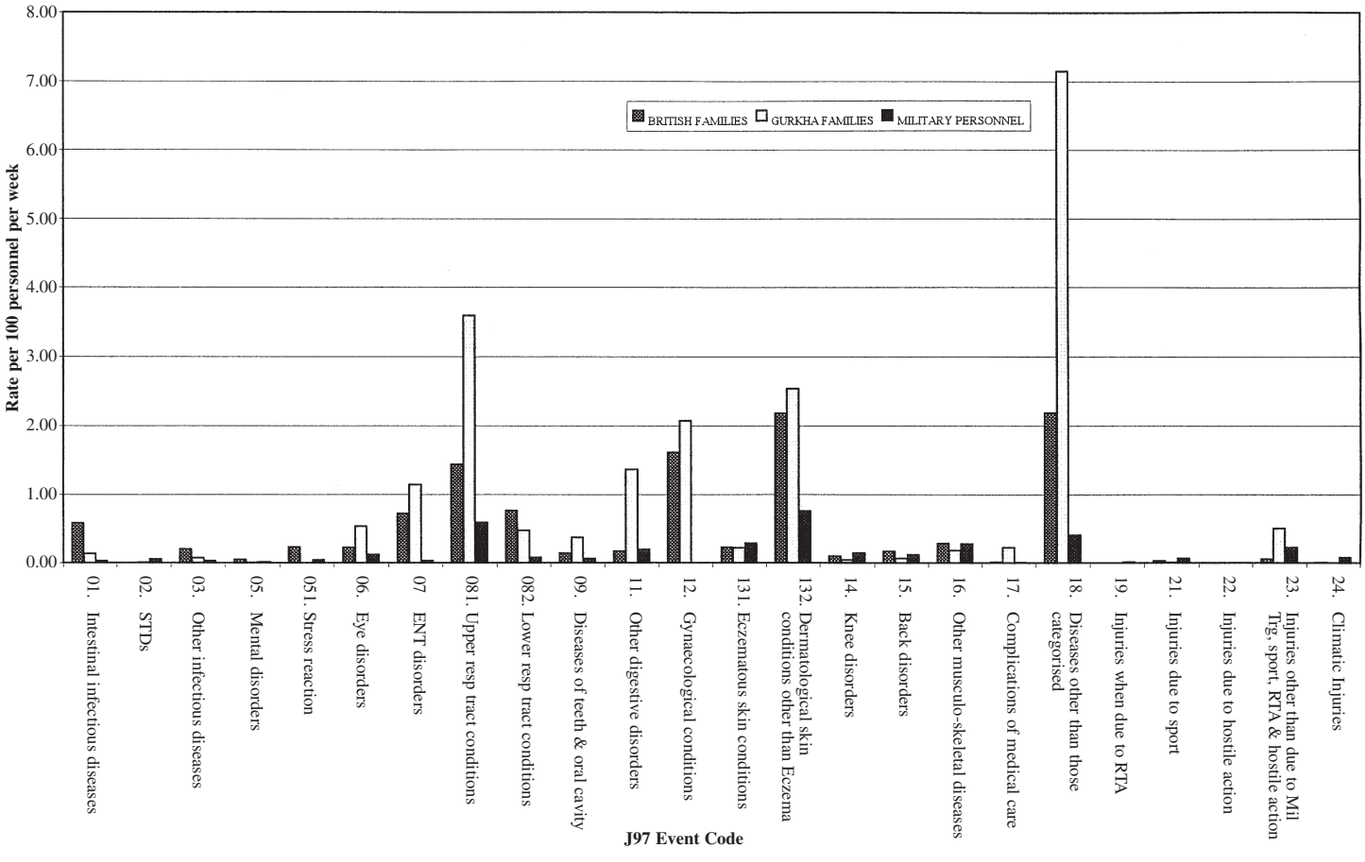

Fig 1. Rate of First Attendance by Group for all EVENTS. Period = Weeks 1 - 52, 1997 and Weeks 1 - 26, 1998.

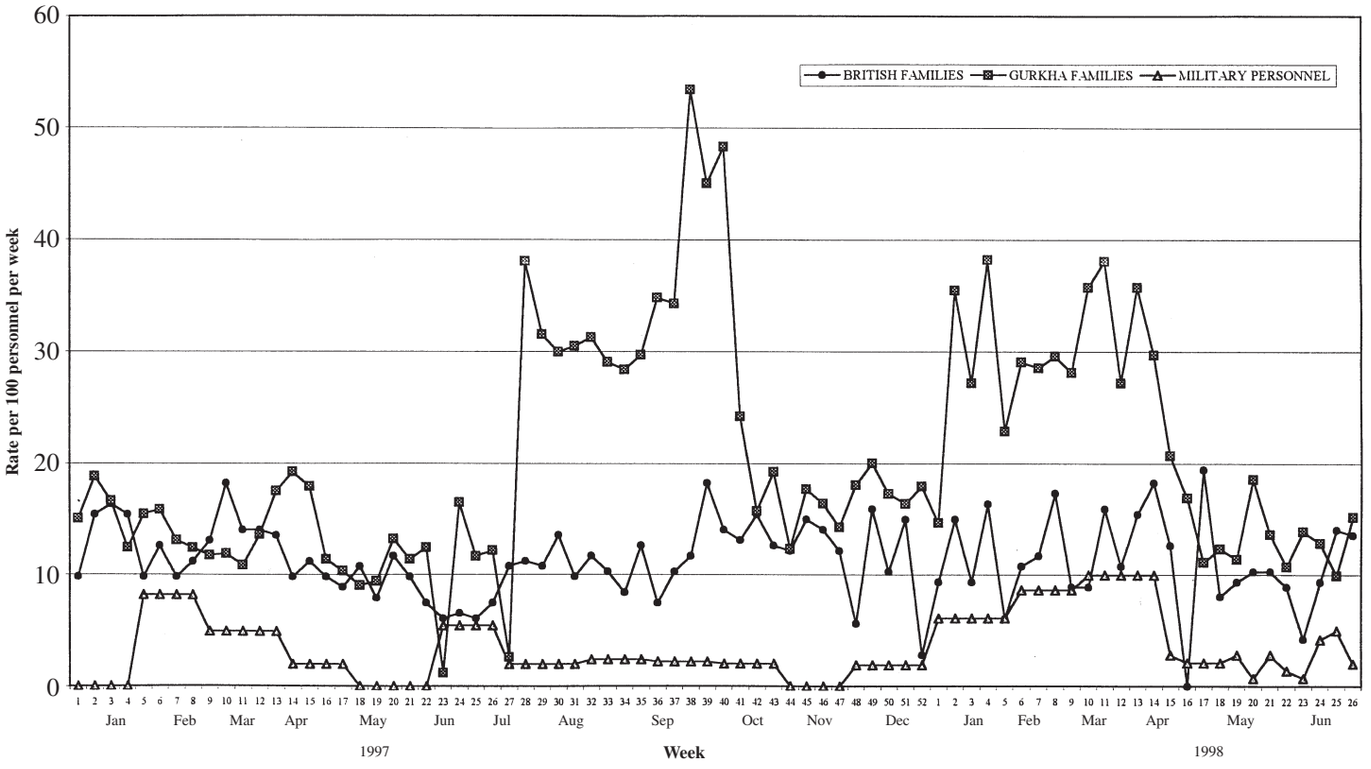

Fig 2. Rate of First Attendances by Week per Group for all EVENTS. Period = Weeks 1 - 52, 1997 and Weeks 1 - 26, 1998.

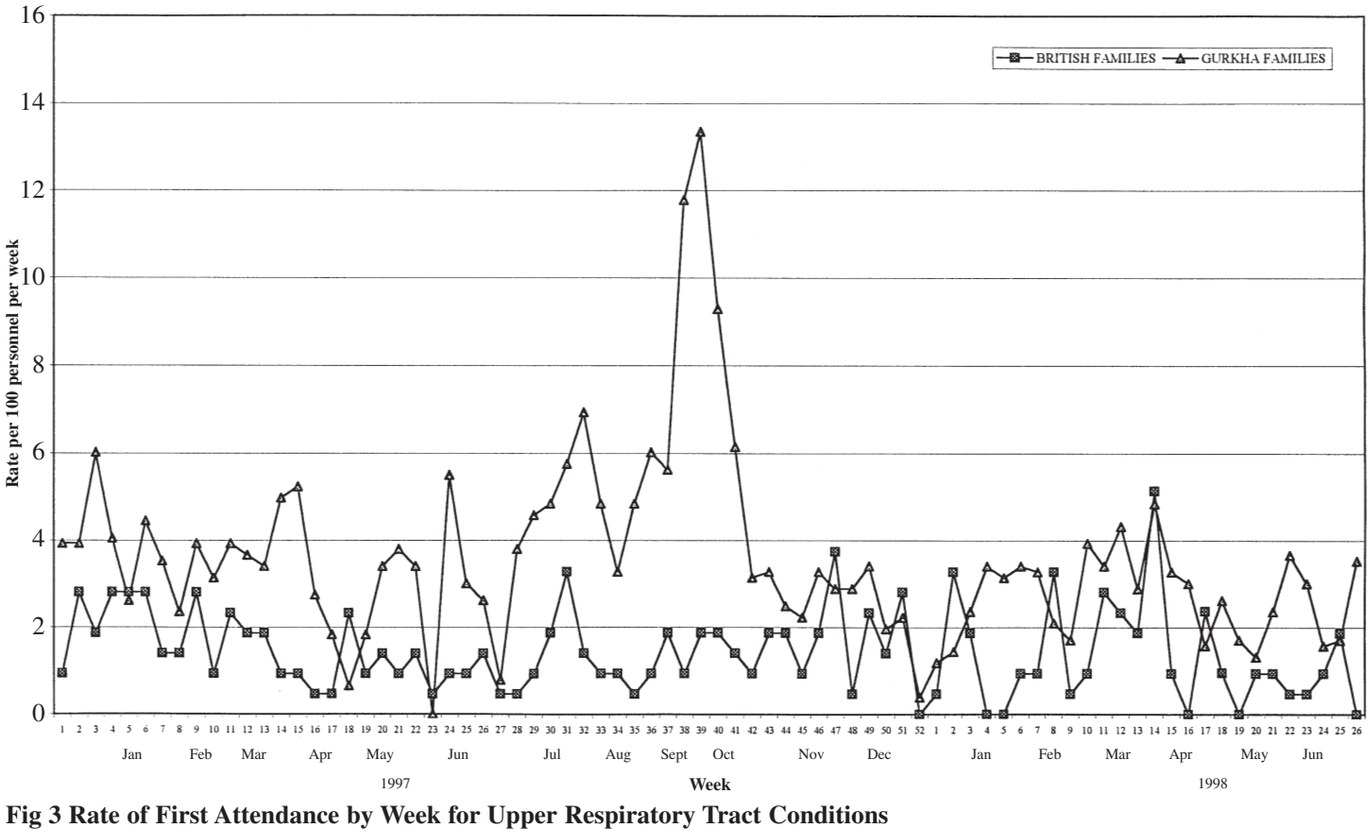

Fig 3 Rate of First Attendance by Week for Upper Respiratory Tract Conditions

shows that the distribution of cause of attendance is different between military personnel, British families and Gurkha families. The J97 categories were chosen as a result of pilot studies which examined the attendance pattern of military personnel. The high rate of attendance in families in the J97 Event Code 18 - "*Diseases other than categorised*" is therefore not surprising. It may be necessary to add a category for attendance due to pregnancy if J97 is to be used again for this purpose.

The data collection for the majority of the study period was a

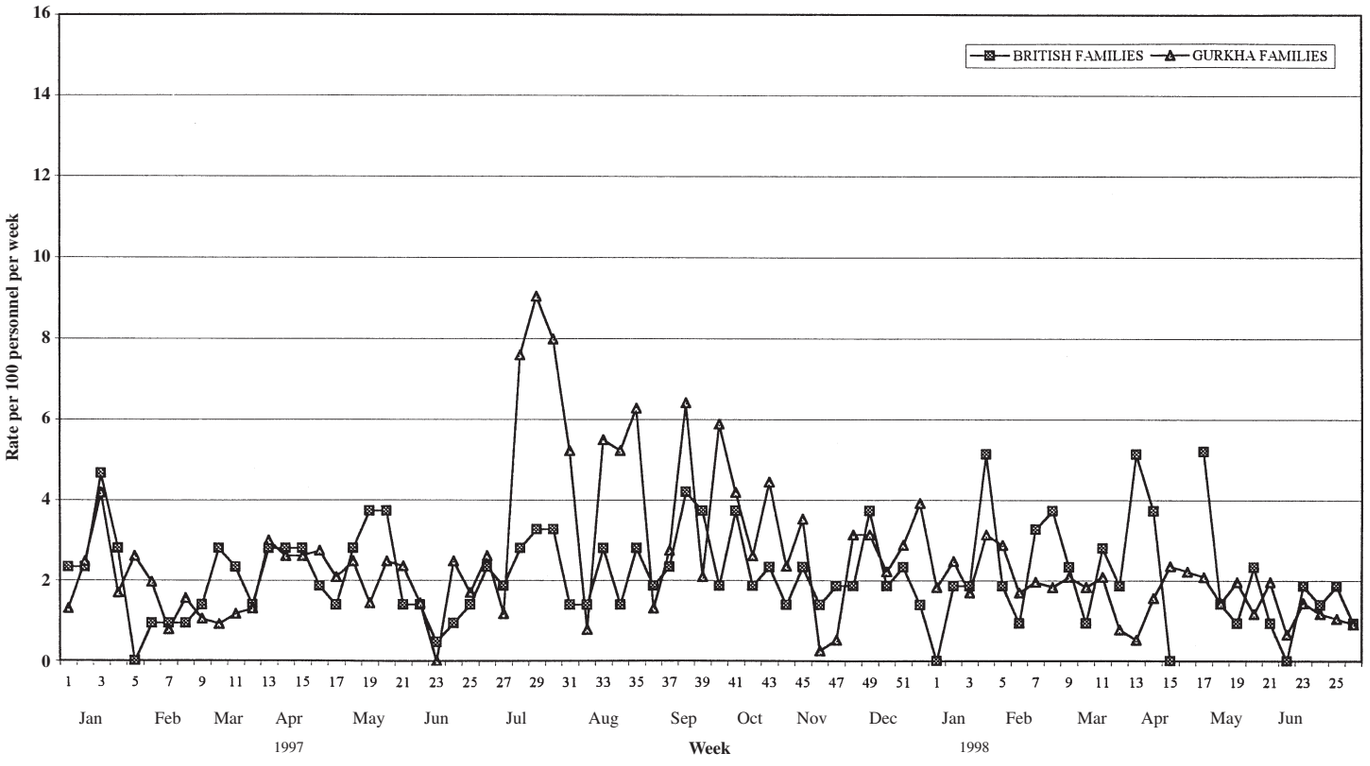

Fig 4. Rate of First Attendance by Week for Dermatological Conditions other than Eczema.

retrospective extraction from clinic attendance records. This is less reliable than prospective data collection. Staff were trained in the J97 coding system but the entries in the clinic records were not made with coding in mind. Clinic records for Gurkha families are kept by different staff than those that keep clinic records for British families. It is possible that the differences between the populations are an artefact of differences in record keeping between the two staff.

Both periods of peak attendance shown in Figure 2 correspond to the reported peak levels of smog in Brunei and thus an association between smog and attendance rate for these conditions is possible. It proved impossible to obtain reliable retrospective records of the levels of smog during the period observed by this study. This is not surprising as the system for the measurement of the smog was evolving throughout the study period. It is not possible to formally test any hypothesis relating to the dose of exposure to the smog with J97 attendance rates with this data. If the smog had persisted it might have been possible to investigate variations in duration and magnitude of exposure of Gurkha families and British families to atmospheric pollution. This would at least have explained if the hypothesis that the difference in attendance rate was due to difference in exposure was possible.

Gurkha families and British families have different living accommodation. British families accommodation is fully air-conditioned but in Gurkha accommodation only the master bedroom is fitted with air-conditioners. Thus Gurkha families may have had a higher level of exposure to the smog than British families. However it is possible that there are other variations in lifestyle between the two populations such as parental smoking habits or cooking styles that might have also affected exposure to airborne allergens or irritants. There may also be cultural differences that affect the decision to seek medical care that would affect attendance rates. Finally J97 codes cannot separate between different pathological processes and thus the variation in attendance rate between British and Gurkha families may be due to a cause independent of the smog such an infective agent (e.g. influenza).

Families are a heterogeneous population composed of children and adult women, some of whom will be pregnant. The pattern of illness in these groups is likely to be different. It was not possible to conduct a separate analysis for these groups. It is possible that the time series analysis of attendance rates might have been more sensitive if the groups had been studied separately.

It is important to emphasise that the principal reason for this study was to measure the effectiveness of control measures introduced in April 98 to manage the risk from exposure to the smog and not to test a hypothesis linking the smog to any health outcome. The use of the J97 health surveillance tool was based on the hypothesis that any adverse health effect arising out of exposure to the smog would lead to a change in weekly attendance rate for the population observed. The retrospective data collection was undertaken to establish baseline attendance rates against which future attendance rates could be compared. The time series analysis suggests a variation in attendance rates between Gurkha families and British families that might generate a number of hypotheses.

Conclusion

This study demonstrates that the J97 health surveillance process can be used as an ‘off-the-shelf’ tool to measure variations in attendance rates between populations of military dependants. The coding system should include a code for pregnancy-related attendance when used for adult female dependants. It is suggested that the study populations should be as homogeneous as possible and that children should be separated from adults. There would be value in establishing normal baseline attendance rates in different military locations so that population pre and post exposure attendance rates can be compared. If J97 is to be used for this purpose, it is important for the study team to be clear how health surveillance is to be used to measure the effectiveness of control measures. This should state explicitly the study population, the presumed

pathological process and the J97 reporting frequency that would be expected to detect any population-based health outcomes. There would be considerable merit in ensuring the system for measuring exposure to the hazard (e.g. environmental monitoring) aggregates dose rates over the same time period as the J97 reporting cycle. For example if J97 is to be reported weekly then the time-weighted average should be based on weekly exposure measurements.

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