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PROJECTIONS OF BATTLEFIELD MEDICAL CASUALTIES  
AMONG U.S. MARINE FORCES FOR VARIOUS  
THEATERS OF OPERATIONS

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Report No. 93-35

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NAVAL MEDICAL RESEARCH AND DEVELOPMENT COMMAND  
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**PROJECTIONS OF BATTLEFIELD MEDICAL CASUALTIES AMONG  
U.S. MARINE FORCES FOR VARIOUS THEATERS OF OPERATIONS**

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Report No. 93-35, supported by the Naval Medical Research and Development Command, Department of the Navy, under Work Unit No. 63706N M0095.005-6204. The views expressed in this article are those of the authors and do not reflect the official policy or position of the Department of the Navy, Department of Defense, or the U.S. Government. Approved for public release, distribution unlimited.

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## EXECUTIVE SUMMARY

### Problem

Medical and manpower communities within all armed service branches require casualty forecasts for various operational scenarios. Casualty and illness rate projections are used to determine required medical resources and personnel needs.

### Objective

The present investigation seeks to provide casualty and disease/nonbattle injury (DNBI) rate projections for U.S. Marines in three operational theaters for varying battle intensities. Additionally, detailed documentation shall be provided describing the methodology used to project the rates.

### Approach

Casualty and DNBI data were extracted from military operations spanning four decades. The empirically derived rates of casualties and illnesses were then adjusted for differences in terrain, weather, and disease incidence within specific theaters.

### Results

Projected rates of casualty incidence were highest in Southwest Asia, followed by East Asia and Europe. Disease rate projections were similar between Southwest Asia and East Asia, with Europe disease rate forecasts approximately half of those in the Asian regions. Casualty and disease rates varied with combat/support status of troops. Projected rates indicated wide variations in the daily casualty incidence of wounded-in-action and killed-in-action.

### Conclusions

Required medical resources and personnel replacements will differ greatly with theater of operation, battle intensity, and mix of combat and support troops. Accurate logistical planning requires attention to extremes in daily rate incidence as well as rate averages.

**PROJECTIONS OF BATTLEFIELD MEDICAL CASUALTIES AMONG  
U.S. MARINE FORCES FOR VARIOUS THEATERS OF OPERATIONS**

**INTRODUCTION**

Medical and manpower planning communities within all service branches need casualty forecasts for differing operational scenarios. These projections are used to determine the medical resource and personnel requirements of combat operations in various geographical theaters. Logisticians require estimates of daily casualty and illness rates per 1000 strength per day to determine the medical and manpower demands. The specific equipment, medical supply, and personnel needs are then generated by several resourcing models used by the joint services. These models include the Deployable Medical Systems (DEPMEDS) and the Medical Planning and Execution System (MEPES) module of the Joint Operation Planning and Execution System (JOPES).

Casualty rate and disease/nonbattle injury (DNBI) incidence input to the MEPES module was requested from the Naval Health Research Center (NHRC) by the Chief of Naval Operations (N931)<sup>1</sup>. MEPES Reference Data Report Layouts provided to NHRC indicate that rates of wounded-in-action (WIA), killed-in-action (KIA), disease, nonbattle injury, and battle fatigue are needed for five levels of battle intensity for different theaters of operation. Further, the illness and casualty rate projections should represent hospital admission incidence per 1000 troop strength per day.

**METHOD**

Casualty and DNBI incidence data were extracted for combat and support troops from administrative and medical records of military operations spanning four decades<sup>2</sup>. The combat operations data were extracted from Muster Rolls/Unit Diaries of U.S. Marine combat and support troops participating in the assault on Okinawa, Korean War, and the Vietnam conflict. Noncombat data were extracted for Marines stationed in Tsingtao, China prior to the Korean Conflict and in Japan following the cessation of hostilities in World War

II. Casualty and illness data were also extracted from medical logs of the United Kingdom amphibious force engaged in the Falklands War.

Historical accounts<sup>3,4,5,6,7,8</sup> were examined to determine battle intensities during different phases of the operations. Based on accounts of enemy resistance, different operations and phases of operations were assigned one of the five JOPES-designated levels of combat intensity: no combat, light intensity, moderate intensity, heavy intensity, and intense.

Rates of WIA, KIA, and DNBI medical presentations during the operations assigned to specific battle intensities were then calculated. Rates of hospital admissions were computed as the percentage of medical presentations retained at treatment facilities for three days or more. Each operational component (for example, the Battle of Hue during the Vietnam conflict) that contributed to a specific battle intensity rate (e.g., intense battle tempo) was weighted according to the percentage of total mandays accounted for by the individual operation. The formulas and weighted hospital admission rates, for support and combat troops, for each battle intensity are found in Appendix D. As the vast majority of this empirical data was obtained from the operations in Okinawa, Korea, and Vietnam, the rates in Appendix D are the basis for the rate projections for an operational scenario in East Asia.

Examination of the casualty and DNBI incidence sustained during the various operations indicated rate differences between infantry and support troops<sup>2</sup>. Likewise, the medical casualty rates of troops supporting the infantry battalions (tank battalions, artillery regiments, etc.) were lower than those of infantry units but higher than those of supporting units located toward the rear. Because medical admission rates differ between logistic and combat units, the overall rate for a Marine ground-based operation will be contingent upon the mix of support and combat troops.

Personnel data provided to the Naval Health Research Center indicates that a Marine Division and supporting units comprises

approximately 26,000 troops. This force includes approximately 9000 infantry troops (34.3%); 5500 non-infantry divisional troops such as tank, artillery, light-armored infantry, and combat engineer units (21.2%); and 11,600 non-divisional logistic troops composing the Force Service Support Group and the Surveillance, Reconnaissance, Intelligence Group (44.5%).

#### **EAST ASIA OPERATIONAL SCENARIO**

Appendix A contains medical admission rate projections for an East Asia combat scenario. These rate projections are based on the empirical data from East Asia and represent a divisional force composed of the aforementioned percentages of troop types. Also included in Appendix A are the rate projections for the individual troop-type components. Lastly, Appendix A contains graphs depicting the variations in daily WIA, KIA, and DNBI rates which may be sustained by infantry troops and an entire force during various battle intensities. Estimated fluctuations in casualty and illness rates are based on analyses examining the rate distribution characteristics of the extracted casualty/illness data<sup>10</sup>.

Medical planning models, however, require that DNBI rates be broken into a battle-fatigue component, a nonbattle-injury component, and a disease component. Determination of a battle-fatigue proportion of the DNBI rate is based on Israeli research<sup>9</sup> indicating that rates of battle fatigue (BF) approximate one-fourth of the WIA rate. Also, previous research by the Naval Health Research Center determined that 17% of the DNBI rate during a military operation was attributable to nonbattle injuries (NBI). The overall DNBI rates incurred during the East Asia operations, then, were apportioned into a battle-fatigue component ( $WIA * 0.25$ ), a nonbattle-injury component ( $DNBI * 0.17$ ), and a disease component ( $DNBI - (BF + NBI)$ ).

#### **SOUTHWEST ASIA OPERATIONAL SCENARIO**

Appendix B contains medical admission rate projections for a Southwest Asia combat scenario as well as graphs depicting the

expected variation in casualty and DNBI rates. Because the empirical data were from East Asia military operations (with the exception of the Falklands War), methodologies were needed to adjust the baseline casualty, illness, and nonbattle injury rates for another theater of operation.

Extensive analyses examining factors related to the prediction of battle casualties have been published by Dupuy.<sup>11,12</sup> Using his factors for the effects of topographical characteristics and climatic conditions on casualty incidence, the ratio between known East Asia casualties and expected Southwest Asia casualties could be quantified. Topographical characteristics include terrain and foliage, while climatic conditions encompass temperature, precipitation, and cloud cover. Dupuy has calculated the impact of various terrains and climates upon a base casualty rate; for instance, because of restricted mobility and fields of fire limitations inherent in a rugged, mountainous region as opposed to a flat, bare, hard terrain Dupuy assigns a lesser "casualty impact" factor to the rugged terrain. Similarly, because inclement weather would reduce mobility, effectiveness of weapons systems, and overall fighting ability, a cold wet climate is also assigned a dampening effect on casualty rates when compared to a dry, temperate climate. The projected terrain and climate impacts on casualty sustainment used by Dupuy are shown in Appendix E.

The next step in the East Asia-Southwest Asia casualty rate conversions was to contrast the terrains and climates of the two regions. Topographical and meteorological descriptions for East Asia (Korea, Vietnam, Okinawa) and Southwest Asia (Iran, Iraq) were assessed<sup>13,14</sup>, and Dupuy "casualty impact" factors were assigned. Appendix E also contains the terrain and climate descriptions for these regions, the factors assigned, and the calculations for the rate adjustment. This methodology indicated that casualty rates in Southwest Asia, due to terrain and climate differences, would be 1.84 times as high as those in East Asia.

Next, the disease incidence and nonbattle injury rates evidenced in East Asia needed to be adjusted to reflect any



expected differences for the Southwest Asia region. A previous study<sup>15</sup> of U.S. Navy foreign shore facilities indicated that illness rates in Northeast Asia were approximately 70% of the rate in Southwest Asia. This 70% figure, however, did not include disease data from Southeast Asia (where rates of infectious disorders are higher than in Northeast Asia) while the empirical data from East Asia military operations did include a Southeast Asia component. Consequently, the decision was taken to project disease rates for Southwest Asia at the same level as that witnessed among the aggregated East Asia components (Okinawa, Korea, Vietnam). Nonbattle injury rates were converted from East Asia to Southwest Asia in accordance with actual rate differentials of Army troops fighting in these two regions<sup>16</sup>. Appendix E also contains the nonbattle injury adjustment factors.

#### **EUROPE OPERATIONAL SCENARIO**

Appendix C contains medical admission rate projections for a Europe combat scenario as well as graphical depictions of the expected variation in casualty and DNBI rates. Topographical and climatic characteristics for a wide region of Europe (Albania, Austria, Bulgaria, Czechoslovakia, Yugoslavia, Greece, Hungary, Poland, Romania) were assessed. Appendix F contains the terrain and weather characteristics for the European regions, the "casualty impact" factors for each region, and the calculations to convert the empirically derived East Asia casualty rates to projected rates for a conflict in the European theater.

Research comparing disease rates between theaters<sup>15</sup> indicated that the rate for Europe was 0.454 times that evidenced in Southwest Asia; this factor was then used to project the disease rates in a European theater of operations. Nonbattle injury rates were converted from East Asia to Europe in accordance with the actual rate differential of Army troops fighting in these two regions<sup>16</sup>. Appendix F also contains the nonbattle injury adjustment factors.

## SUMMARY

Medical resource planning for military operations is contingent upon accurate projections of the casualty and DNBI rates likely to be sustained. Armed with reliable estimates of medical casualty incidence, logisticians may then pre-position the needed supplies, equipment, and health care personnel.

The rate projections in this report indicate that large differences may be anticipated in casualty rates, and to a lesser extent, disease rates, depending on the theater of operations. Also, the overall casualty and disease rates will likewise vary greatly with the force mix of combat and support troops.

Several DNBI data points among the support troops are, perhaps, counterintuitive and warrant further explanation. The empirical data analyzed indicated that, among support troops, the DNBI rates were slightly lower during operations of heightened battle intensity than during noncombat and light-intensity operations. This anomaly between combat and support troops may be explained by two dynamics: (1) elevated combat stress and reductions in sanitary conditions with increasing battle tempo are not as pronounced among support troops as they are with infantry troops, and (2) medical care is more accessible and acceptable for support troops during non-combat/low battle-intensity operations than during higher intensity operations where medical resources must be available for mass casualties and troops performing logistical support view their functions as critical to the military operation.

It is important that the casualty and illness rates in this document not be viewed as static functions. Wide rate variations in daily incidence will be evidenced, especially among casualty rates, with increasing battle tempo. In this regard it is important that medical planning focuses on the extremes in casualty rates as well as on the averages. Lastly, the rates projected are based on a determined, motivated adversary not unlike the ones faced in Japan, Korea, and Vietnam. Training, motivation, and armaments of the adversary may all have additional impact on the rates provided.

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## Appendix A

# Service Scenario Reference Data

Service: **Marines**

Scenario Id: **Division and Supporting Units -- East Asia**

<b>Casualties / 1000 / Day</b>					
<b>Combat Intensity</b>					
<b>Casualty Type</b>	<b>1 (None)</b>	<b>2 (Light)</b>	<b>3 (Moderate)</b>	<b>4 (Heavy)</b>	<b>5 (Intense)</b>
<b>WIA</b>	<b>0</b>	<b>0.53</b>	<b>1.18</b>	<b>2.42</b>	<b>3.61</b>
<b>KIA</b>	<b>0</b>	<b>0.15</b>	<b>0.26</b>	<b>0.61</b>	<b>0.95</b>
<b>BF</b>	<b>0</b>	<b>0.13</b>	<b>0.29</b>	<b>0.63</b>	<b>0.90</b>
<b>DIS</b>	<b>0.98</b>	<b>0.98</b>	<b>0.98</b>	<b>1.21</b>	<b>1.29</b>
<b>NBI</b>	<b>0.20</b>	<b>0.23</b>	<b>0.26</b>	<b>0.37</b>	<b>0.44</b>

# Service Scenario Reference Data

Service: Marines

Scenario Id: Infantry Battallions -- East Asia

<b>Casualties / 1000 / Day</b>					
<b>Combat Intensity</b>					
<b>Casualty Type</b>	<b>1 (None)</b>	<b>2 (Light)</b>	<b>3 (Moderate)</b>	<b>4 (Heavy)</b>	<b>5 (Intense)</b>
<b>WIA</b>	<b>0</b>	<b>1.33</b>	<b>2.75</b>	<b>5.77</b>	<b>7.64</b>
<b>KIA</b>	<b>0</b>	<b>0.37</b>	<b>0.60</b>	<b>1.44</b>	<b>2.00</b>
<b>BF</b>	<b>0</b>	<b>0.33</b>	<b>0.68</b>	<b>1.51</b>	<b>1.91</b>
<b>DIS</b>	<b>0.98</b>	<b>0.99</b>	<b>1.60</b>	<b>2.00</b>	<b>2.00</b>
<b>NBI</b>	<b>0.20</b>	<b>0.27</b>	<b>0.46</b>	<b>0.71</b>	<b>0.79</b>



# Service Scenario Reference Data

Service: Marines

Scenario Id: Divisional Excluding Infantry -- East Asia

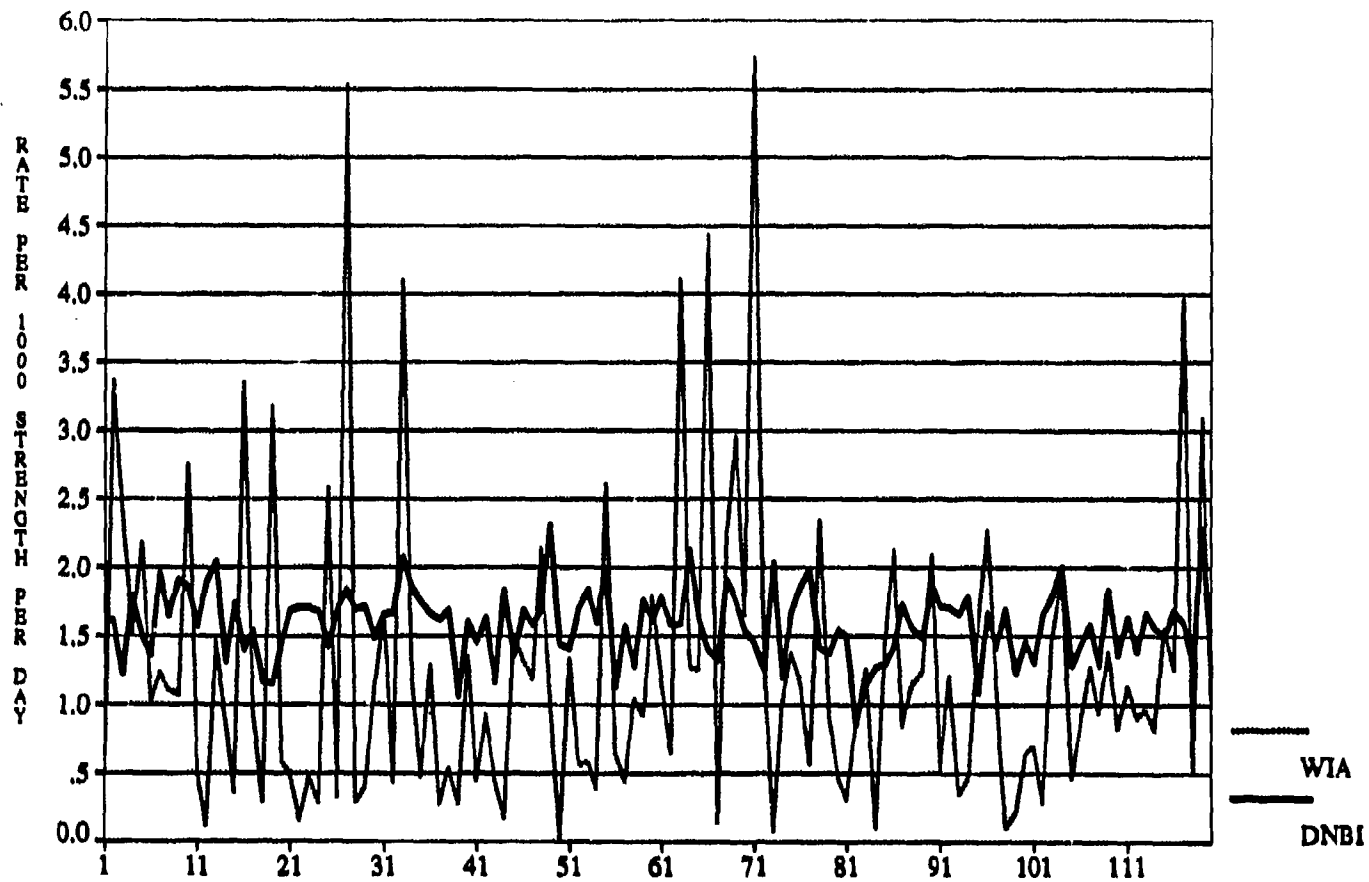
Casualties / 1000 / Day					
Combat Intensity					
Casualty Type	1 (None)	2 (Light)	3 (Moderate)	4 (Heavy)	5 (Intense)
WIA	0	0.34	0.80	1.62	2.64
KIA	0	0.09	0.18	0.41	0.70
BF	0	0.08	0.20	0.42	0.66
DIS	0.98	0.97	0.83	1.02	1.12
NBI	0.20	0.22	0.21	0.29	0.36

# Service Scenario Reference Data

Service: Marines

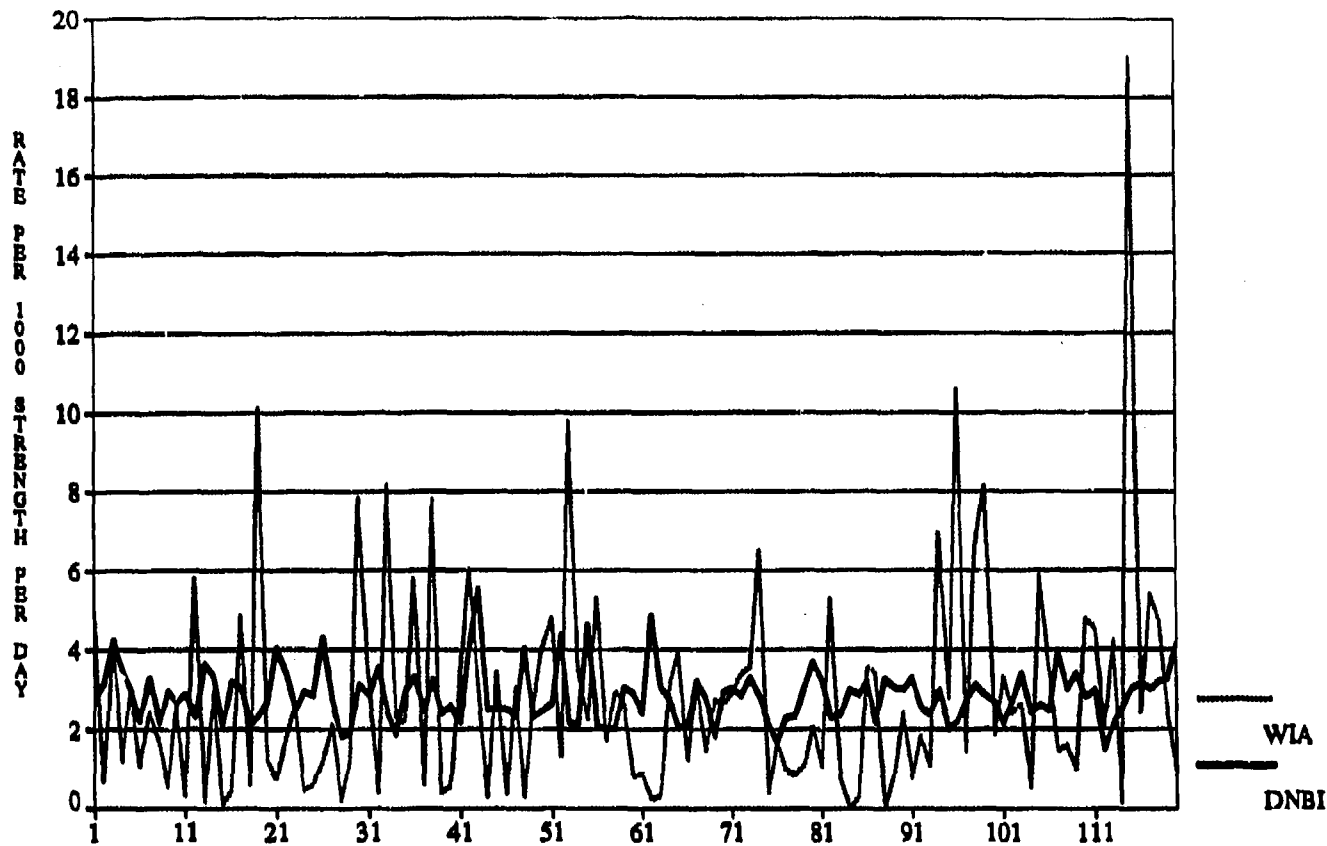
Scenario Id: Extra-Divisional Support Troops -- East Asia

Casualties / 1000 / Day					
Combat Intensity					
Casualty Type	1 (None)	2 (Light)	3 (Moderate)	4 (Heavy)	5 (Intense)
WIA	0	0.01	0.15	0.23	0.97
KIA	0	0	0.04	0.07	0.27
BF	0	0	0.04	0.06	0.24
DIS	0.98	0.97	0.58	0.70	0.82
NBI	0.20	0.20	0.13	0.15	0.22



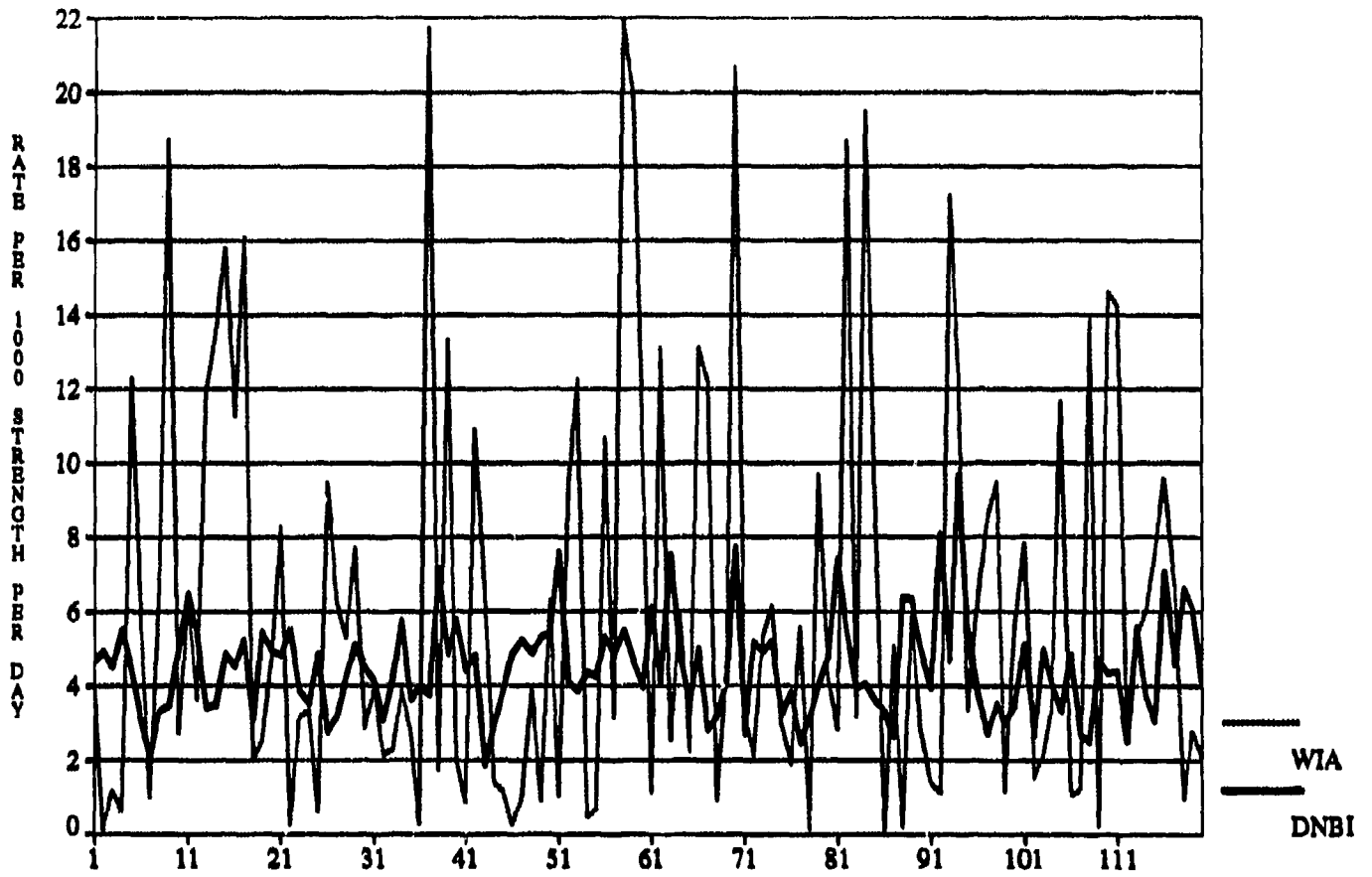
A 120 DAY PERIOD OF AN OPERATION

Projected pattern of WIA and DNBI admissions incurred by Marine infantry units fighting a light-intensity conflict in East Asia



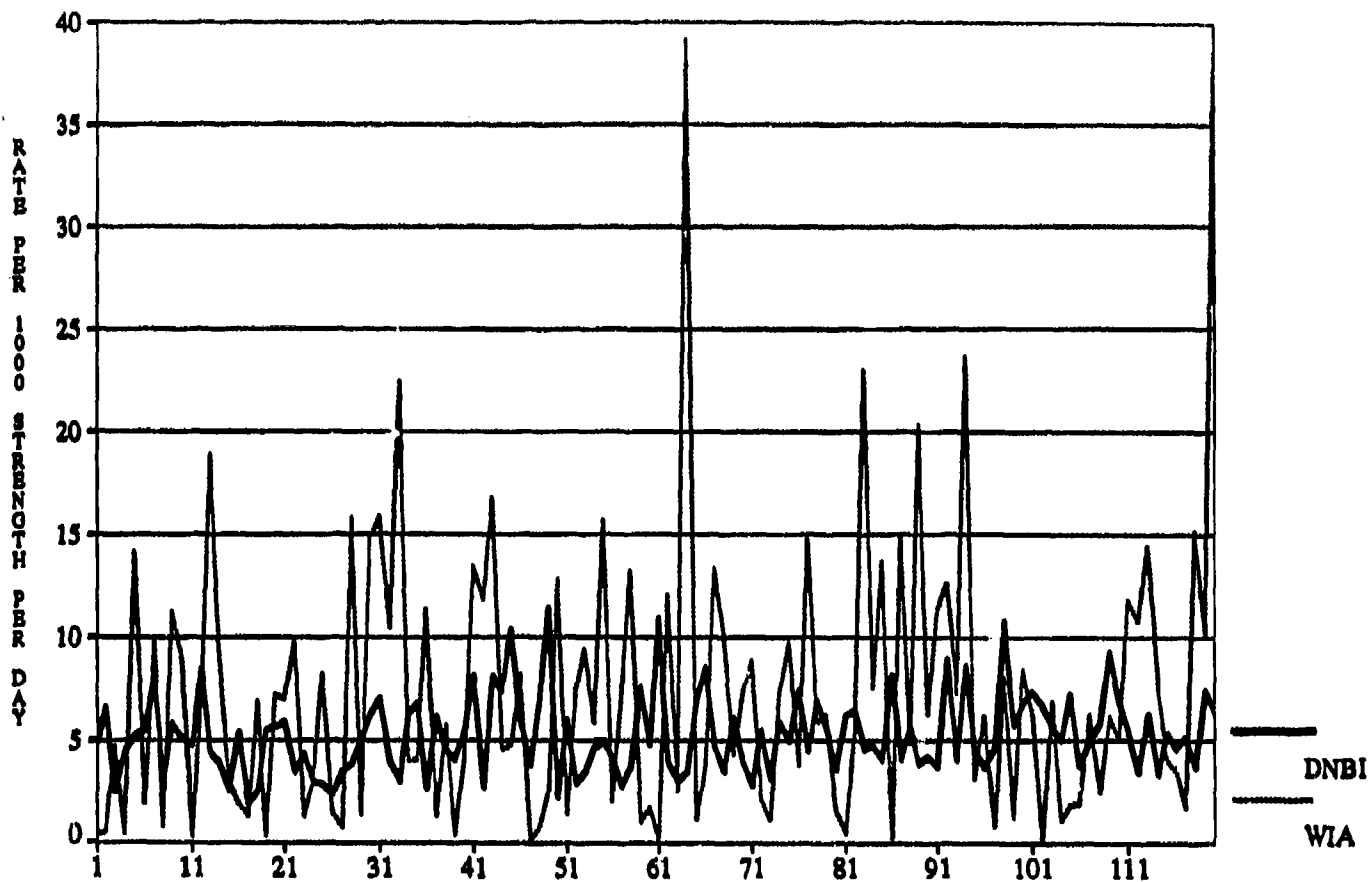
A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by Marine infantry units during a moderate-intensity conflict in East Asia



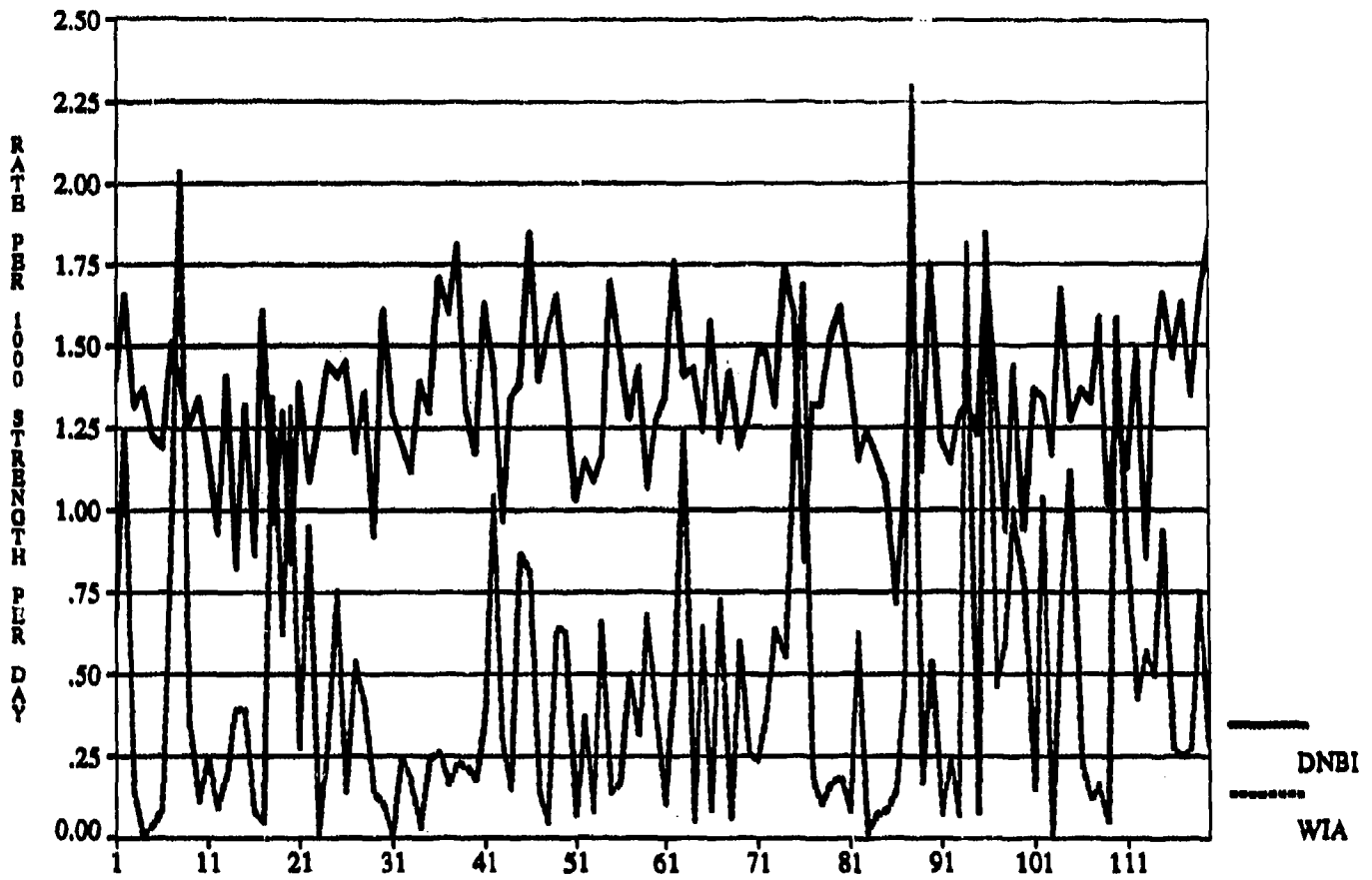
**A 120 DAY PERIOD OF AN OPERATION**

**Projected rates of WIA and DNBI admissions incurred by Marine infantry units fighting a heavy-intensity conflict in East Asia**



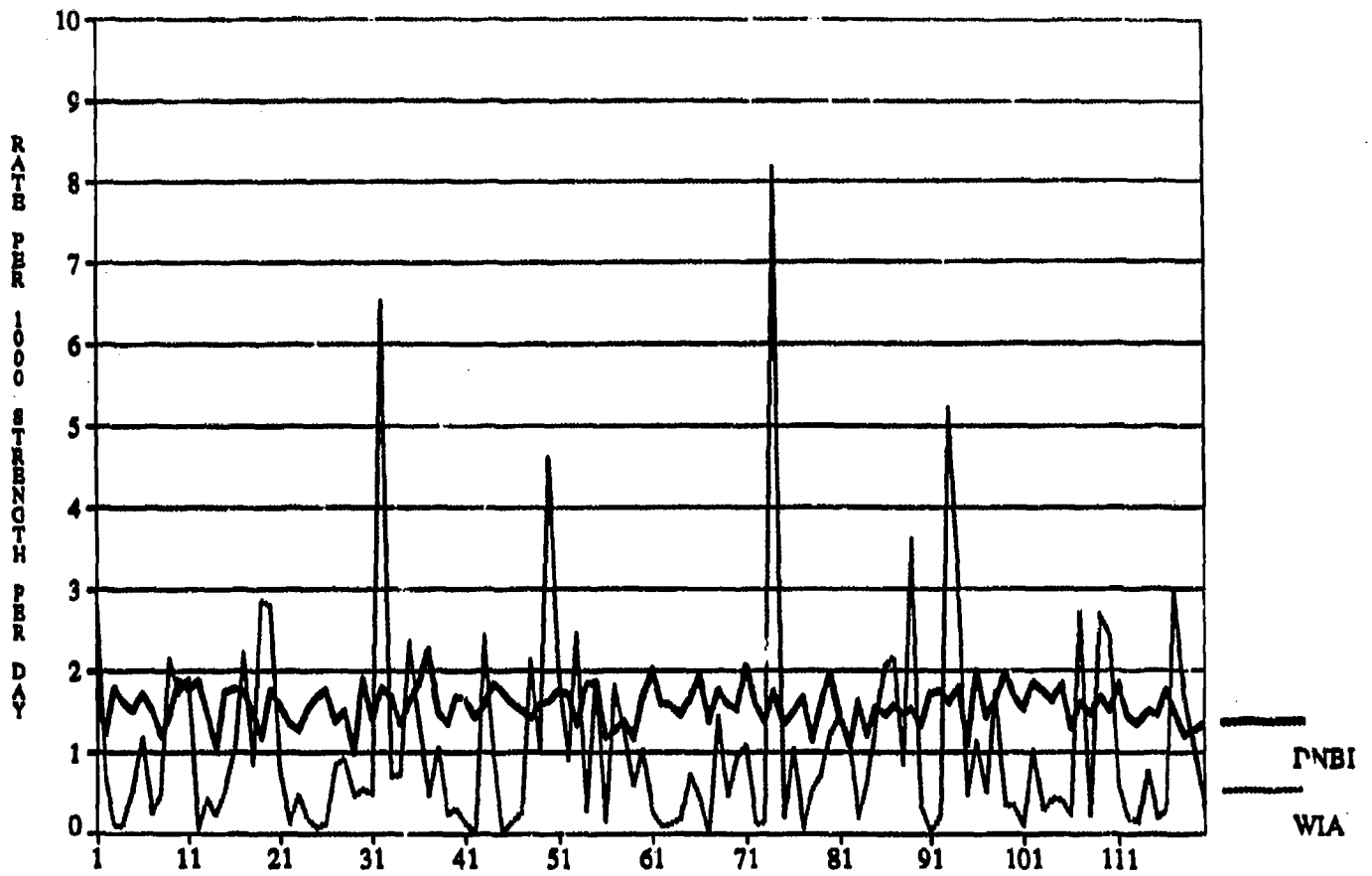
A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by Marine infantry units fighting an 'intense' level conflict in East Asia



A 120 DAY PERIOD OF AN OPERATION

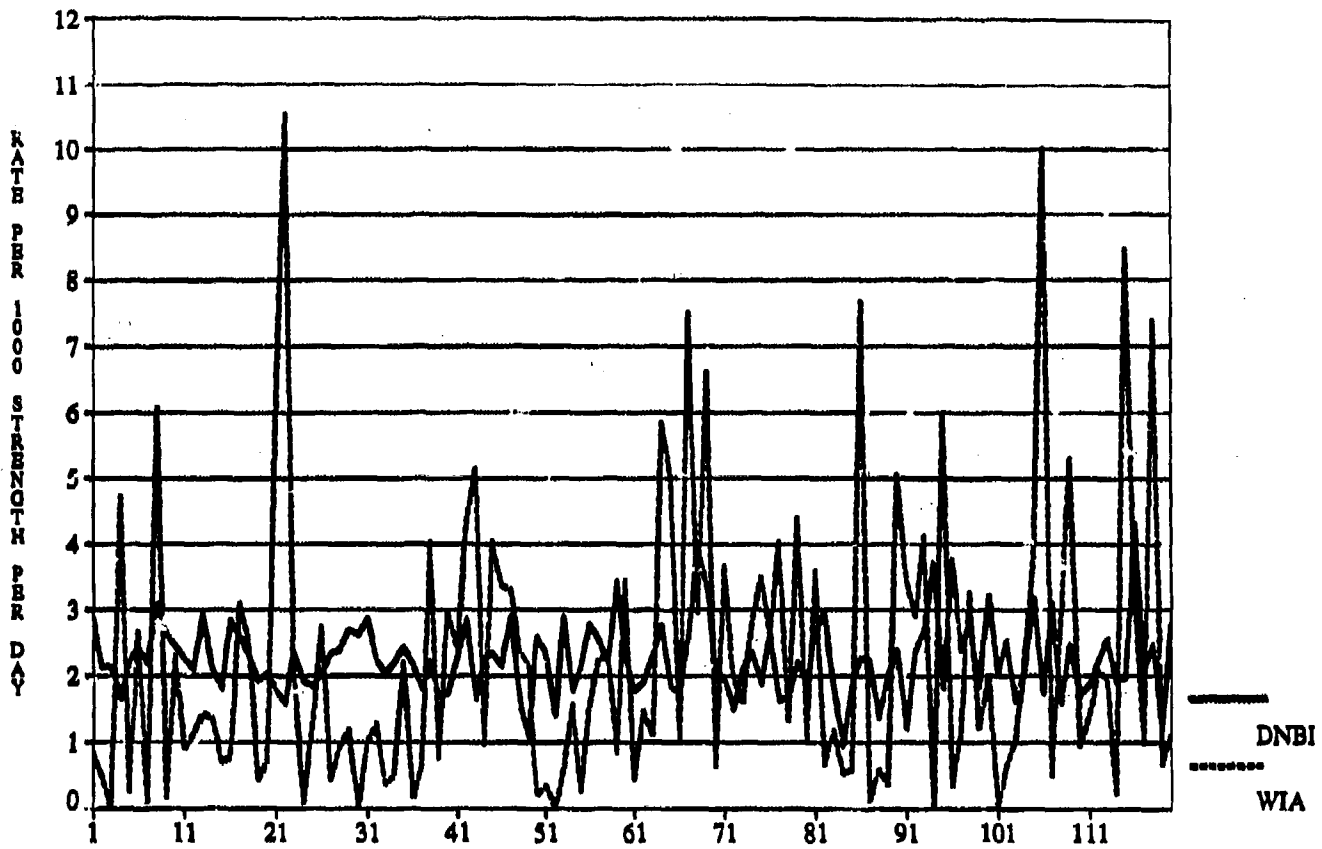
Projected rates of WIA and DNBI admissions incurred by a Marine Division  
and supporting troops fighting a light-intensity conflict in East Asia



A 120 DAY PERIOD OF AN OPERATION

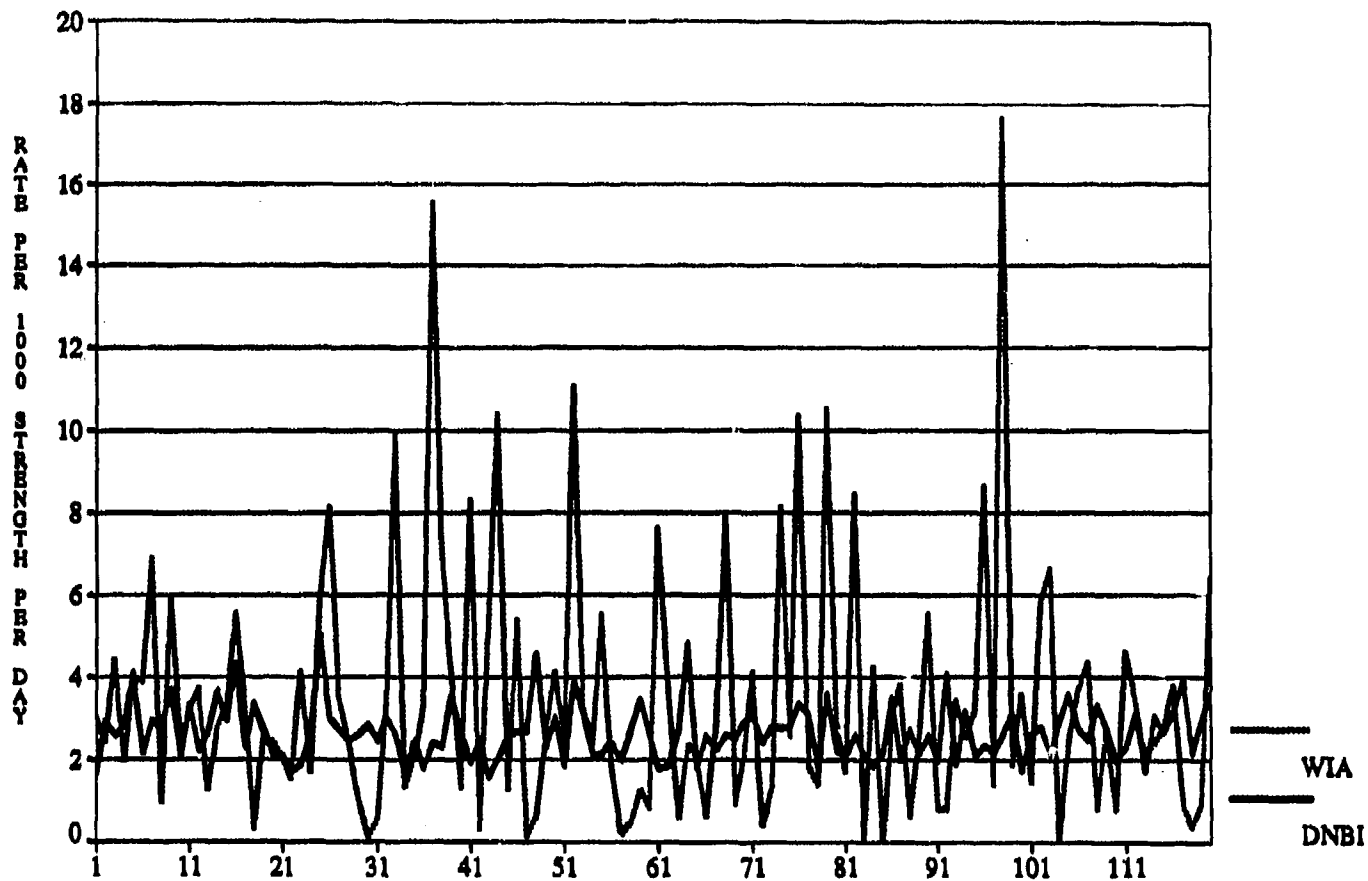
Projected rates of WIA and DNBI admissions incurred by a Marine Division  
and supporting troops during a moderate-intensity conflict in East Asia





A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by a Marine Division  
and supporting troops fighting a heavy-intensity conflict in East Asia



A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by a Marine Division and supporting troops fighting an 'intense' level conflict in East Asia

## Appendix B

# Service Scenario Reference Data

Service: Marines

Scenario Id: Division and Supporting Units -- Southwest Asia

Casualties / 1000 / Day					
Combat Intensity					
Casualty Type	1 (None)	2 (Light)	3 (Moderate)	4 (Heavy)	5 (Intense)
WIA	0	0.97	2.11	4.36	6.27
KIA	0	0.27	0.46	1.10	1.65
BF	0	0.24	0.53	1.09	1.57
DIS	0.98	0.98	0.98	1.21	1.29
NBI	0.26	0.29	0.31	0.44	0.54

# Service Scenario Reference Data

Service: Marines

Scenario Id: Infantry Battalions -- Southwest Asia (Mideast)

<b>Casualties / 1000 / Day</b>					
<b>Combat Intensity</b>					
<b>Casualty Type</b>	<b>1 (None)</b>	<b>2 (Light)</b>	<b>3 (Moderate)</b>	<b>4 (Heavy)</b>	<b>5 (Intense)</b>
<b>WIA</b>	0	2.44	5.05	10.59	14.03
<b>KIA</b>	0	0.68	1.10	2.64	3.67
<b>BF</b>	0	0.61	1.26	2.65	3.51
<b>DIS</b>	0.98	0.99	1.60	2.00	2.00
<b>NBI</b>	0.22	0.30	0.51	0.78	0.87

# Service Scenario Reference Data

Service: Marines

Scenario Id: Divisional Excluding Infantry -- Southwest Asia (Mideast)

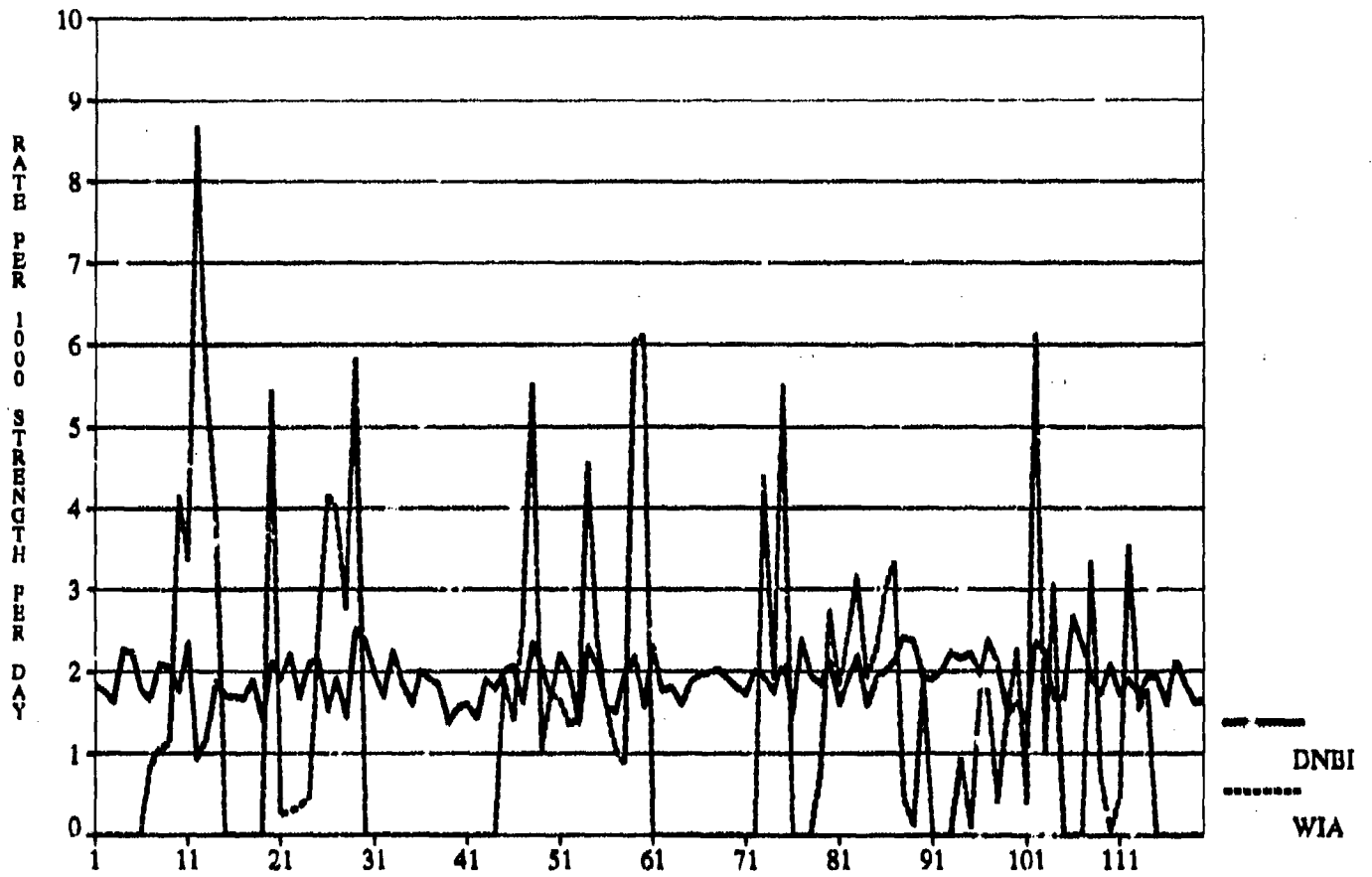
<b>Casualties / 1000 / Day</b>					
<b>Combat Intensity</b>					
<b>Casualty Type</b>	<b>1 (None)</b>	<b>2 (Light)</b>	<b>3 (Moderate)</b>	<b>4 (Heavy)</b>	<b>5 (Intense)</b>
<b>WIA</b>	<b>0</b>	<b>0.62</b>	<b>1.47</b>	<b>2.97</b>	<b>4.85</b>
<b>KIA</b>	<b>0</b>	<b>0.16</b>	<b>0.33</b>	<b>0.75</b>	<b>1.28</b>
<b>BF</b>	<b>0</b>	<b>0.15</b>	<b>0.37</b>	<b>0.74</b>	<b>1.21</b>
<b>DIS</b>	<b>0.98</b>	<b>0.97</b>	<b>0.83</b>	<b>1.02</b>	<b>1.12</b>
<b>NBI</b>	<b>0.27</b>	<b>0.30</b>	<b>0.28</b>	<b>0.39</b>	<b>0.49</b>

# Service Scenario Reference Data

Service: Marines

Scenario Id: Extra-Divisional Support Troops -- Southwest Asia (Mideast)

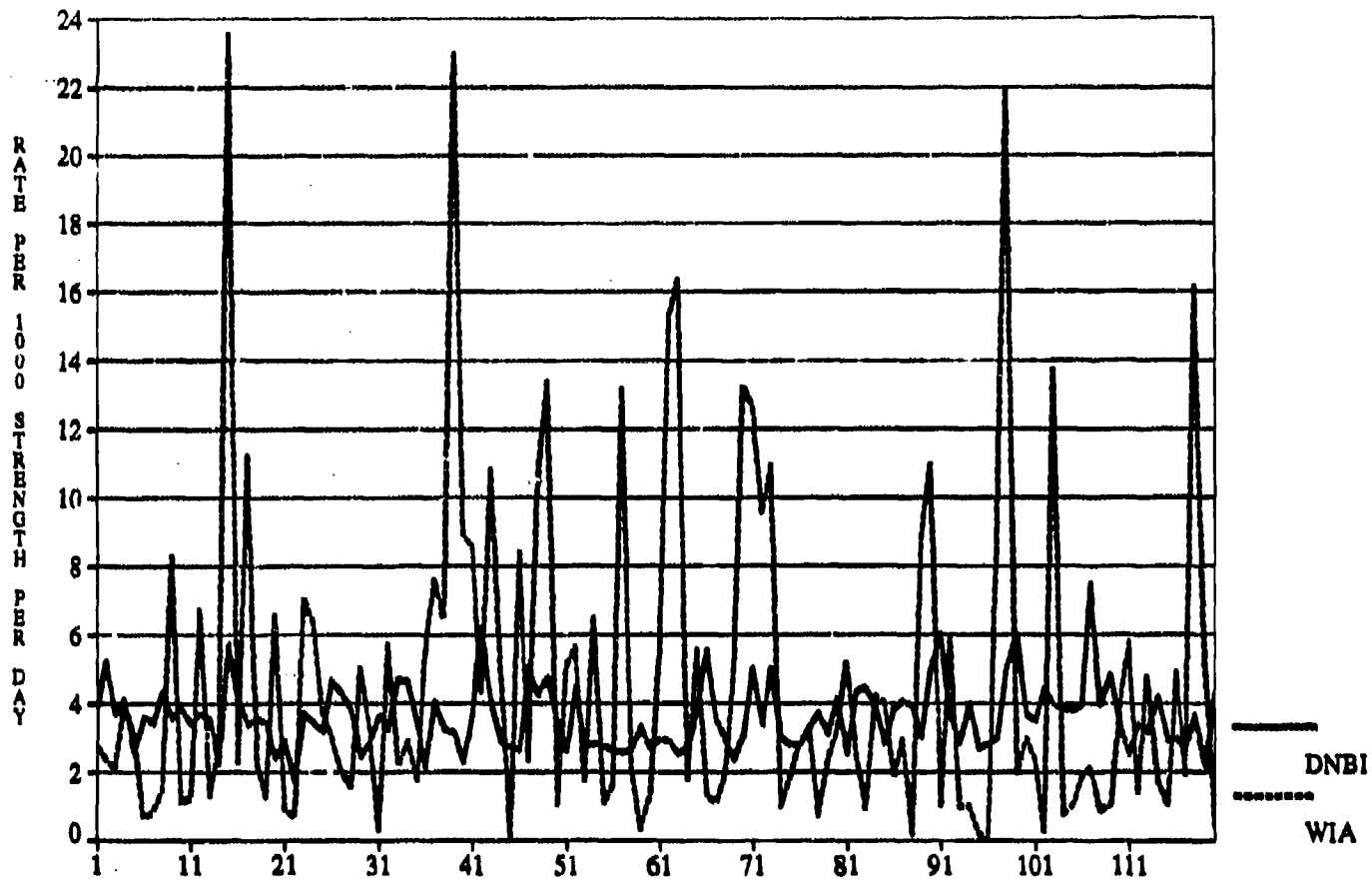
<b>Casualties / 1000 / Day</b>					
<b>Combat Intensity</b>					
<b>Casualty Type</b>	<b>1 (None)</b>	<b>2 (Light)</b>	<b>3 (Moderate)</b>	<b>4 (Heavy)</b>	<b>5 (Intense)</b>
<b>WIA</b>	<b>0</b>	<b>0.01</b>	<b>0.15</b>	<b>0.23</b>	<b>0.97</b>
<b>KIA</b>	<b>0</b>	<b>0</b>	<b>0.04</b>	<b>0.07</b>	<b>0.27</b>
<b>BF</b>	<b>0</b>	<b>0</b>	<b>0.04</b>	<b>0.06</b>	<b>0.24</b>
<b>DIS</b>	<b>0.98</b>	<b>0.97</b>	<b>0.58</b>	<b>0.70</b>	<b>0.82</b>
<b>NBI</b>	<b>0.28</b>	<b>0.28</b>	<b>0.18</b>	<b>0.21</b>	<b>0.31</b>



A 120 DAY PERIOD OF AN OPERATION

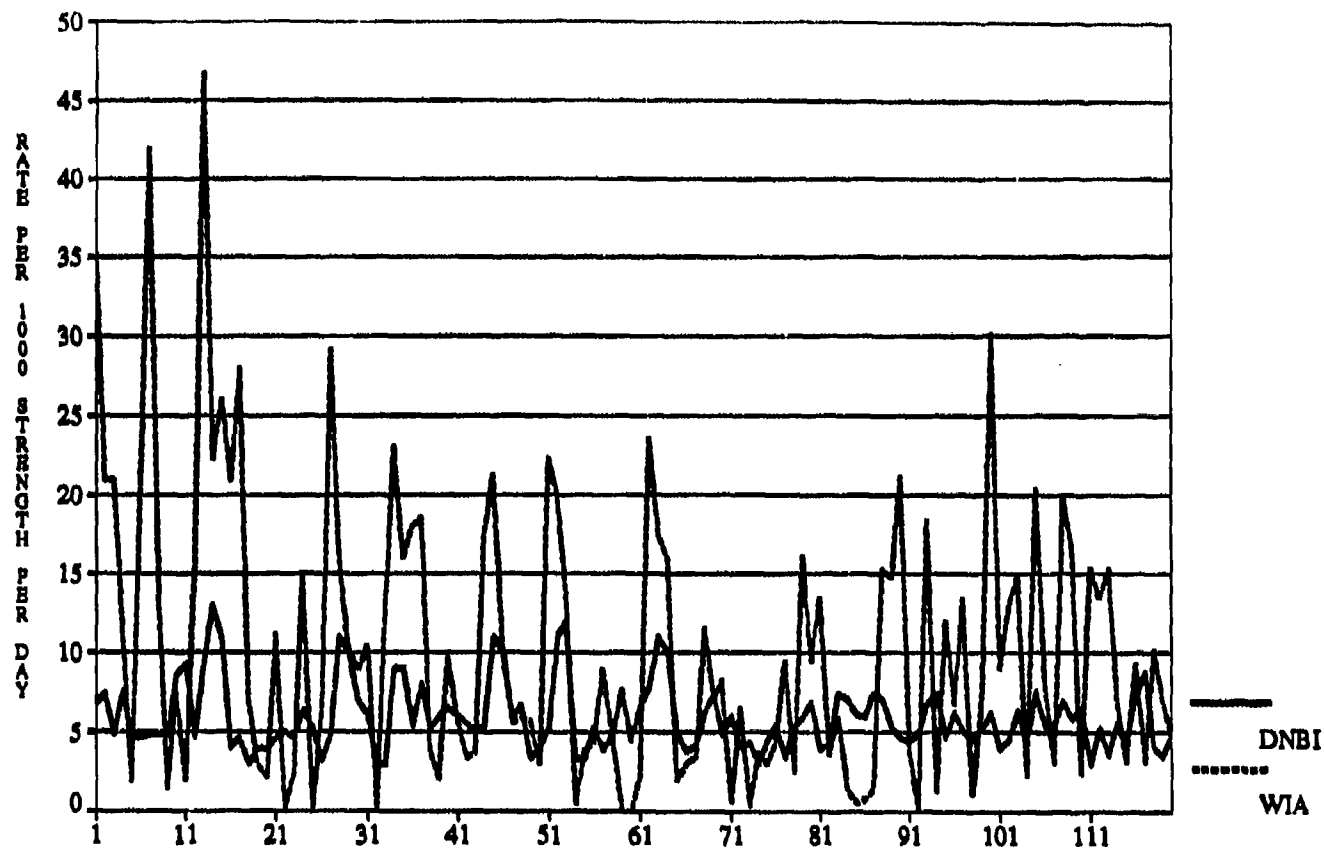
Projected rates of WIA and DNBI admissions incurred by Marine infantry units fighting a light-intensity conflict in S.W. Asia





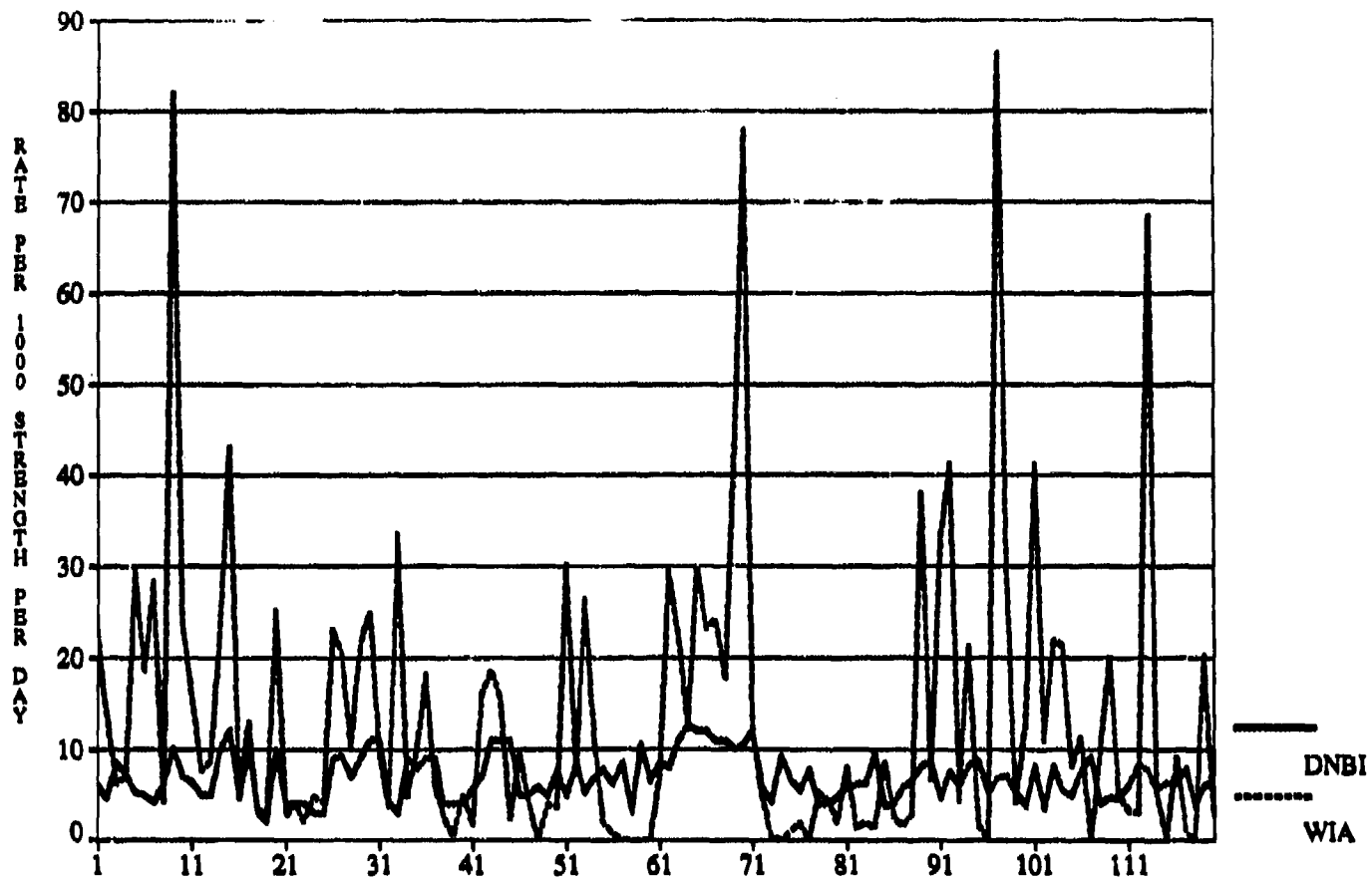
A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by Marine Infantry units fighting a moderate-intensity conflict in S.W. Asia



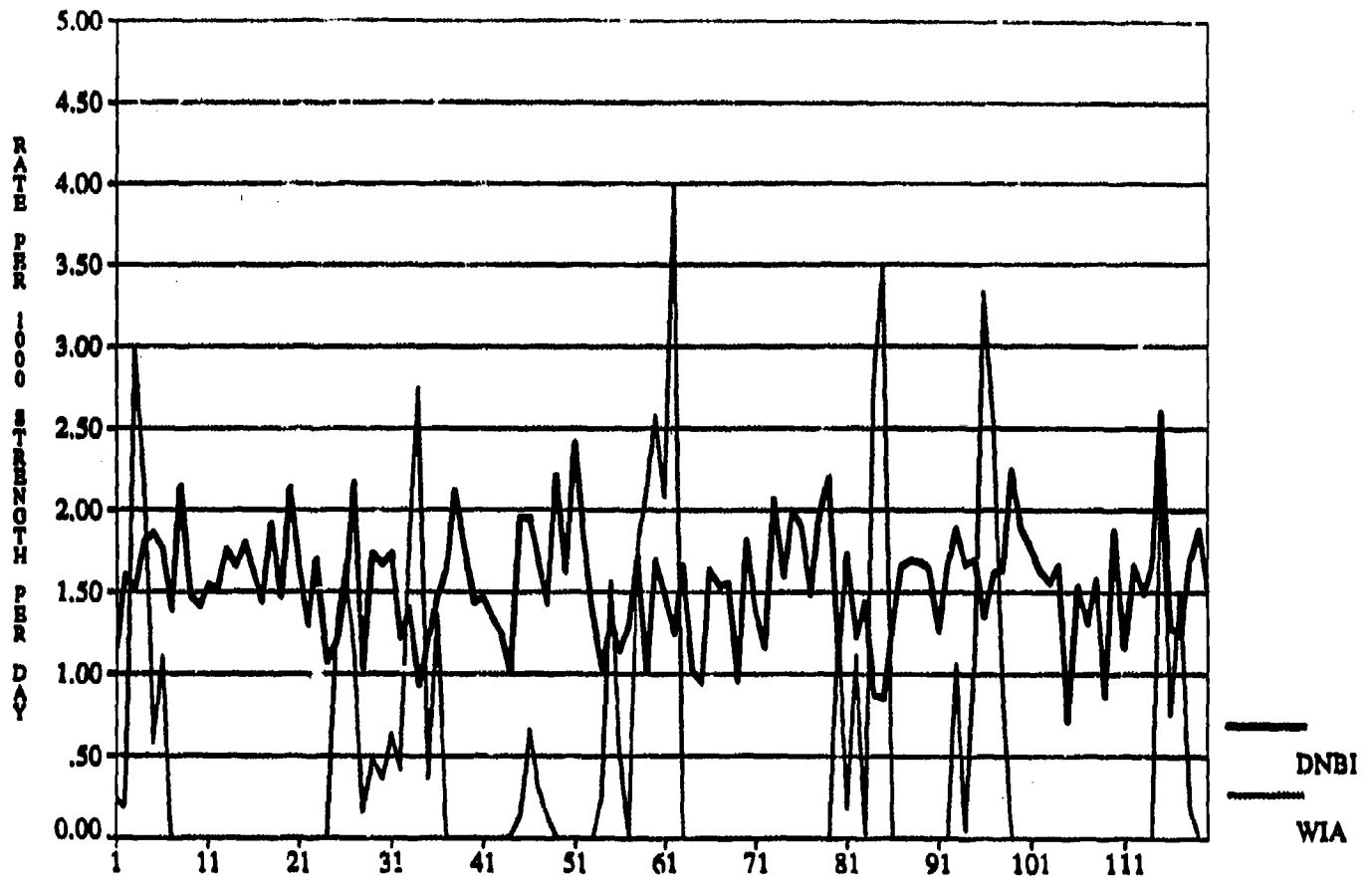
A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by Marine infantry units fighting a heavy-intensity conflict in S.W. Asia



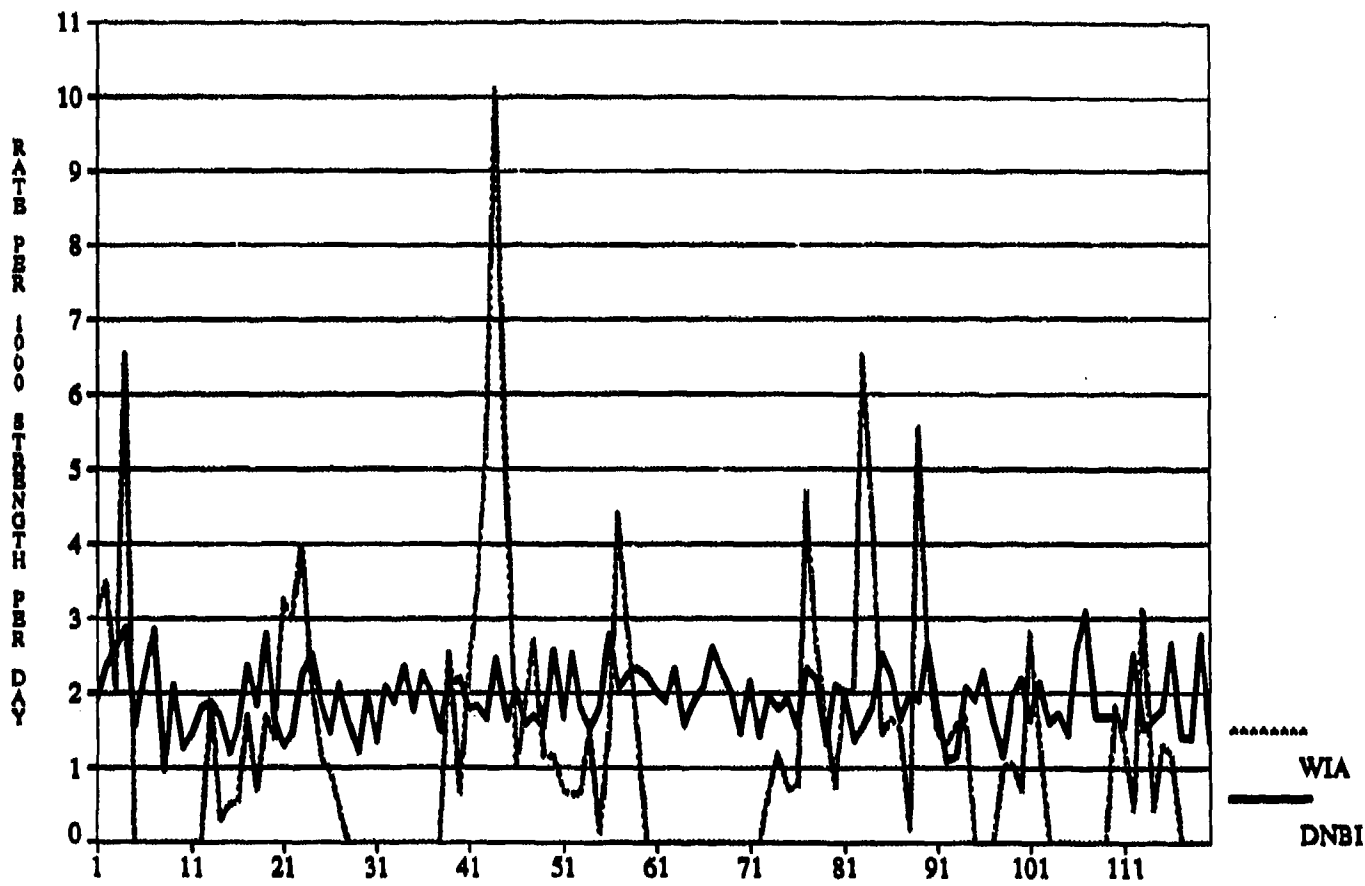
A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by Marine infantry units fighting an 'intense' level conflict in S.W. Asia



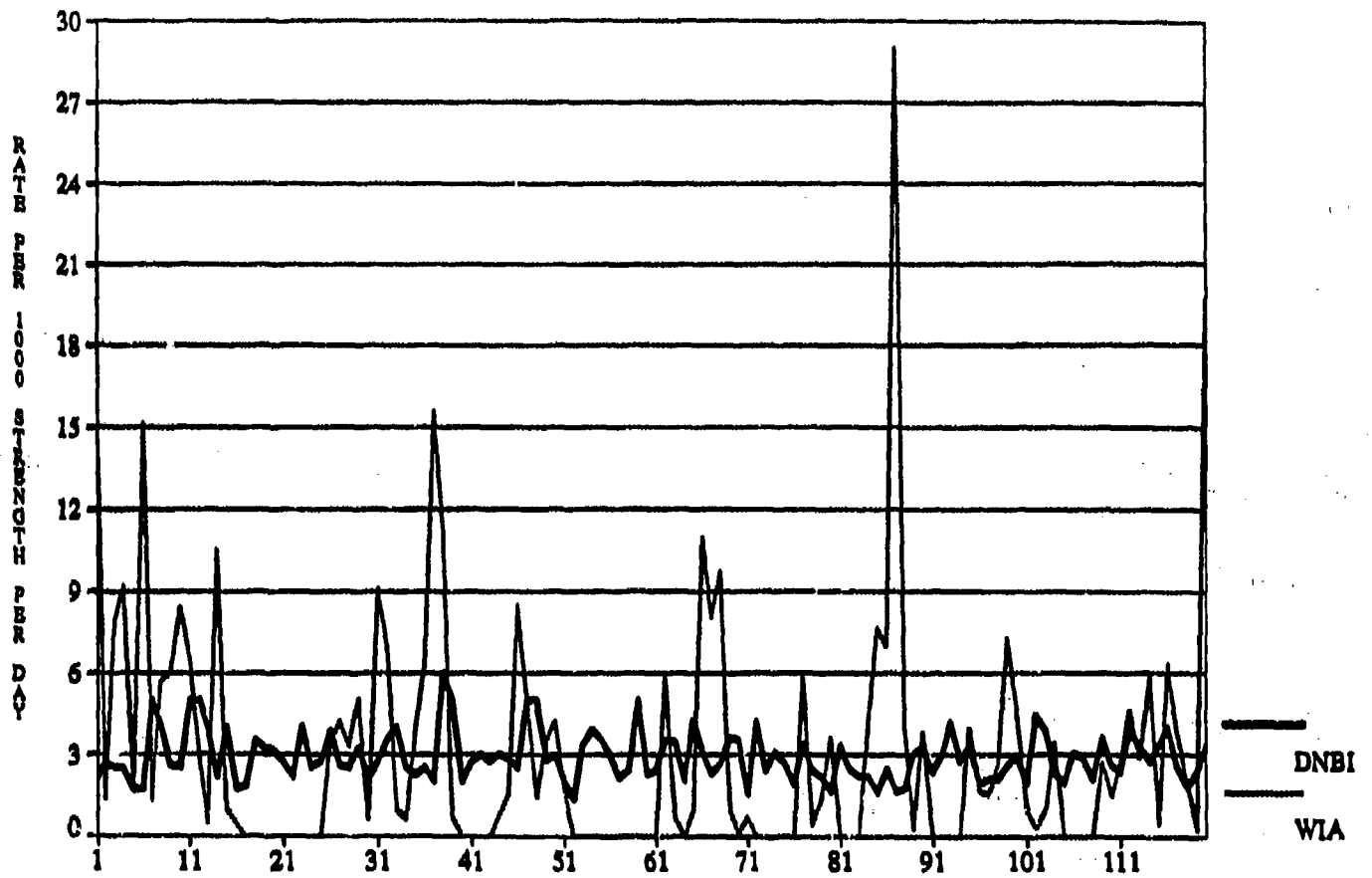
A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by a Marine Division and supporting troops fighting a light-intensity conflict in S.W. Asia



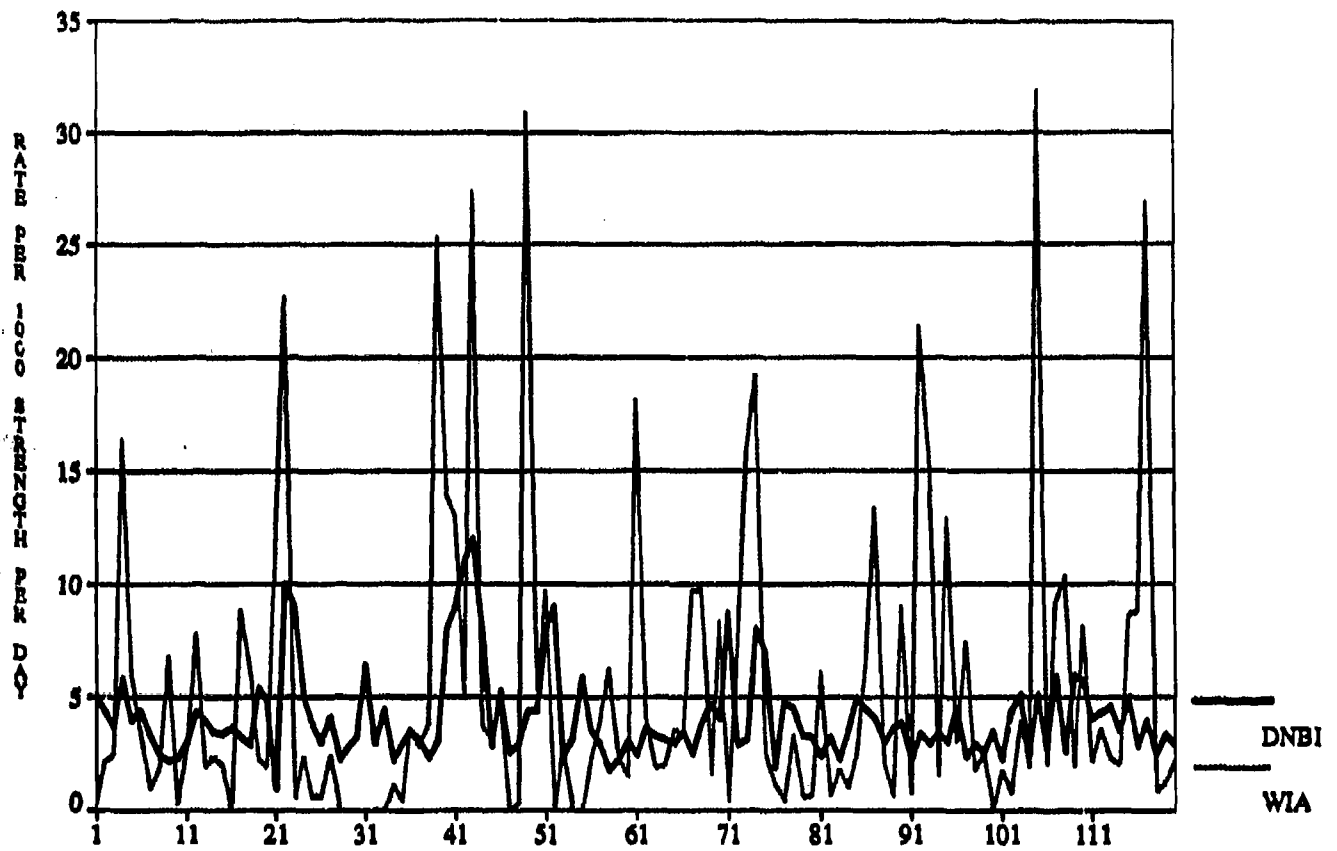
A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by a Marine Division and supporting troops during a moderate-intensity conflict in S.W. Asia



A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by a Marine Division  
and supporting troops fighting a heavy-intensity conflict in S.W. Asia



**A 120 DAY PERIOD OF AN OPERATION**

**Projected rates of WIA and DNBI admissions incurred by a Marine Division and supporting troops fighting an 'intense' level conflict in S.W. Asia**

## Appendix C



# Service Scenario Reference Data

Service: **Marines**

Scenario Id: **Division and Supporting Units -- Europe**

<b>Casualties / 1000 / Day</b>					
<b>Combat Intensity</b>					
<b>Casualty Type</b>	<b>1 (None)</b>	<b>2 (Light)</b>	<b>3 (Moderate)</b>	<b>4 (Heavy)</b>	<b>5 (Intense)</b>
<b>WIA</b>	0	0.72	1.60	3.30	4.91
<b>KIA</b>	0	0.19	0.35	0.83	1.29
<b>BF</b>	0	0.17	0.40	0.83	1.23
<b>DIS</b>	0.44	0.44	0.45	0.55	0.58
<b>NBI</b>	0.29	0.33	0.38	0.55	0.65

# Service Scenario Reference Data

Service: Marines

Scenario Id: Infantry Battalions -- Europe

Casualties / 1000 / Day					
Combat Intensity					
Casualty Type	1 (None)	2 (Light)	3 (Moderate)	4 (Heavy)	5 (Intense)
WIA	0	1.81	3.74	7.85	10.39
KIA	0	0.50	0.82	1.96	2.72
BF	0	0.45	0.94	1.96	2.60
DIS	0.44	0.45	0.73	0.91	0.91
NBI	0.31	0.42	0.71	1.10	1.22

# Service Scenario Reference Data

Service: Marines

Scenario Id: Divisional Excluding Infantry -- Europe

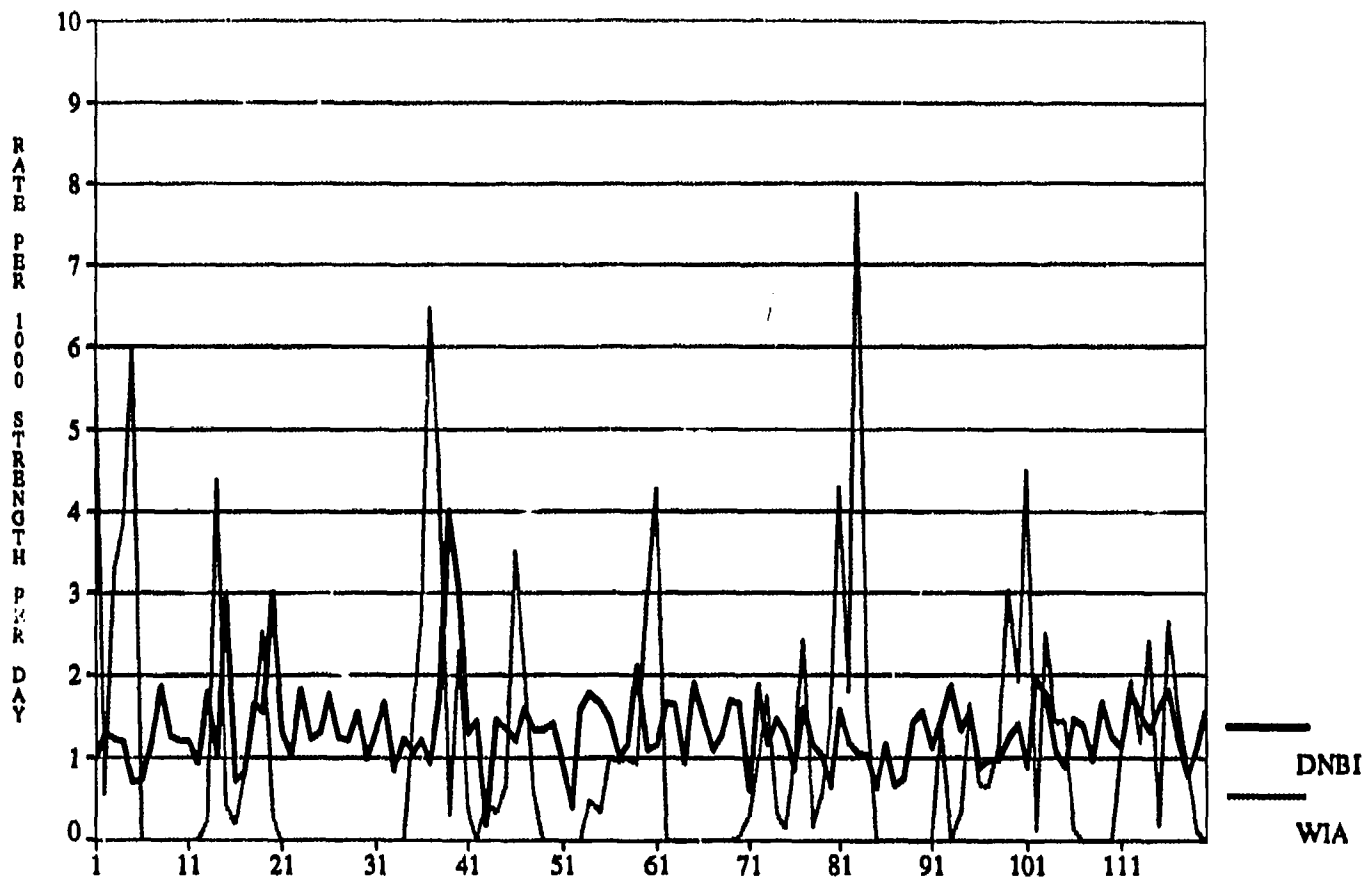
<b>Casualties / 1000 / Day</b>					
<b>Combat Intensity</b>					
<b>Casualty Type</b>	<b>1 (None)</b>	<b>2 (Light)</b>	<b>3 (Moderate)</b>	<b>4 (Heavy)</b>	<b>5 (Intense)</b>
<b>WIA</b>	0	0.46	1.09	2.20	3.59
<b>KIA</b>	0	0.12	0.24	0.56	0.95
<b>BF</b>	0	0.12	0.27	0.55	0.90
<b>DIS</b>	0.44	0.44	0.38	0.46	0.51
<b>NBI</b>	0.29	0.32	0.30	0.42	0.52

# Service Scenario Reference Data

Service: **Marines**

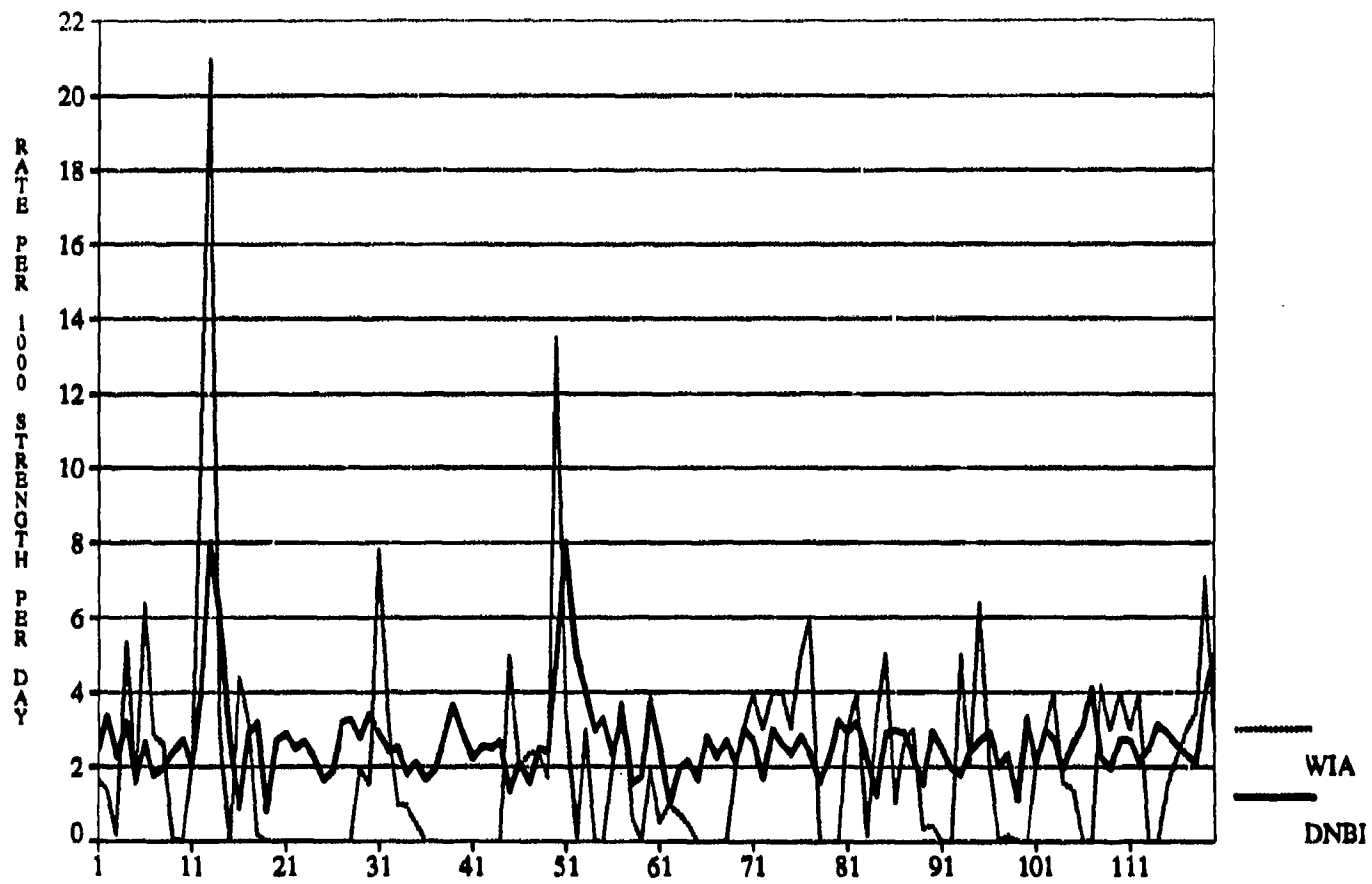
Scenario Id: **Extra-Divisional Support Troops -- Europe**

<b>Casualties / 1000 / Day</b>					
<b>Combat Intensity</b>					
<b>Casualty Type</b>	<b>1 (None)</b>	<b>2 (Light)</b>	<b>3 (Moderate)</b>	<b>4 (Heavy)</b>	<b>5 (Intense)</b>
<b>WIA</b>	0	0.01	0.20	0.31	1.32
<b>KIA</b>	0	0	0.05	0.10	0.37
<b>BF</b>	0	0	0.05	0.08	0.33
<b>DIS</b>	0.44	0.44	0.26	0.32	0.37
<b>NBI</b>	0.26	0.26	0.17	0.19	0.28



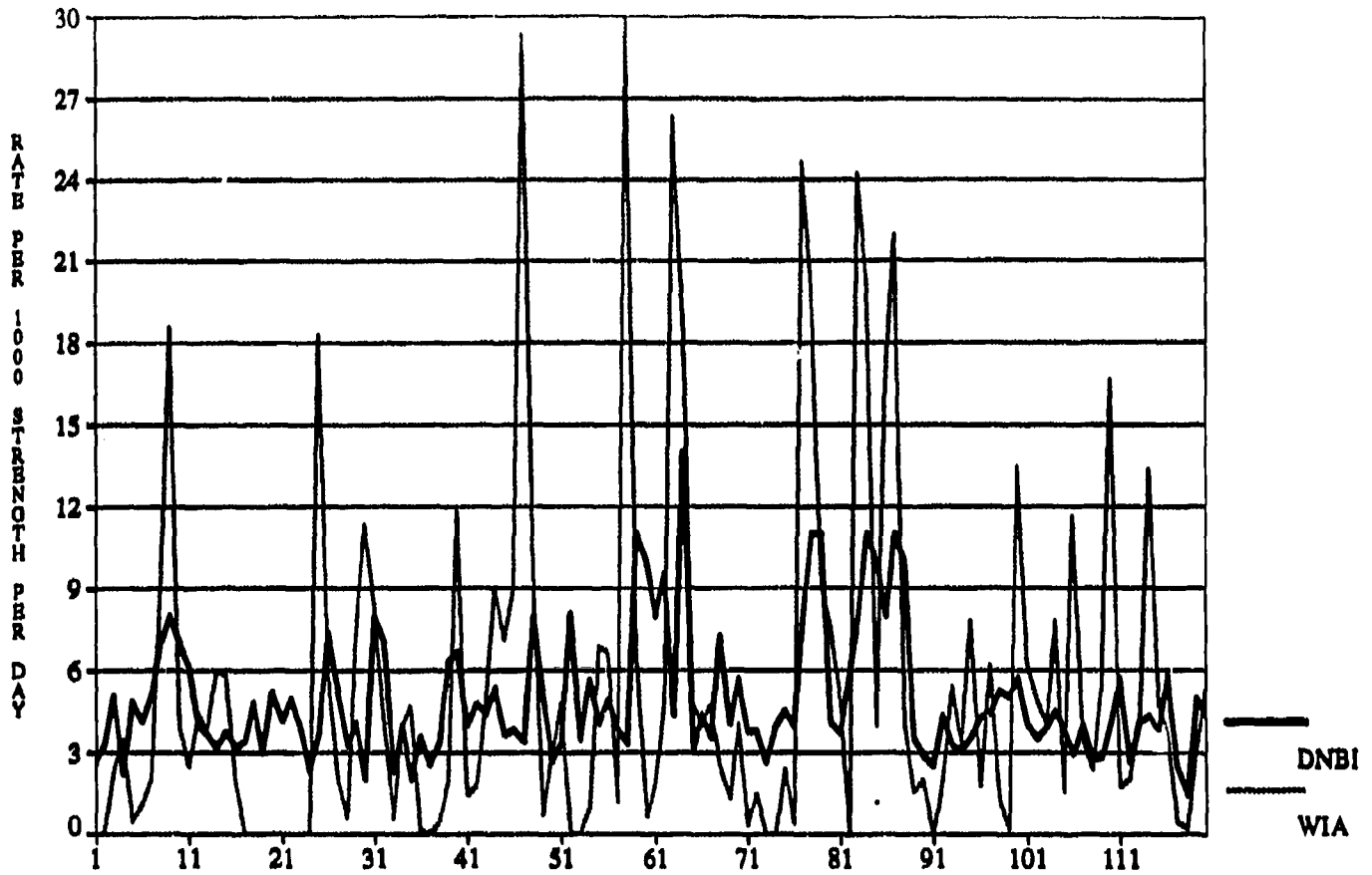
A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by Marine infantry units fighting a light-intensity conflict in Europe



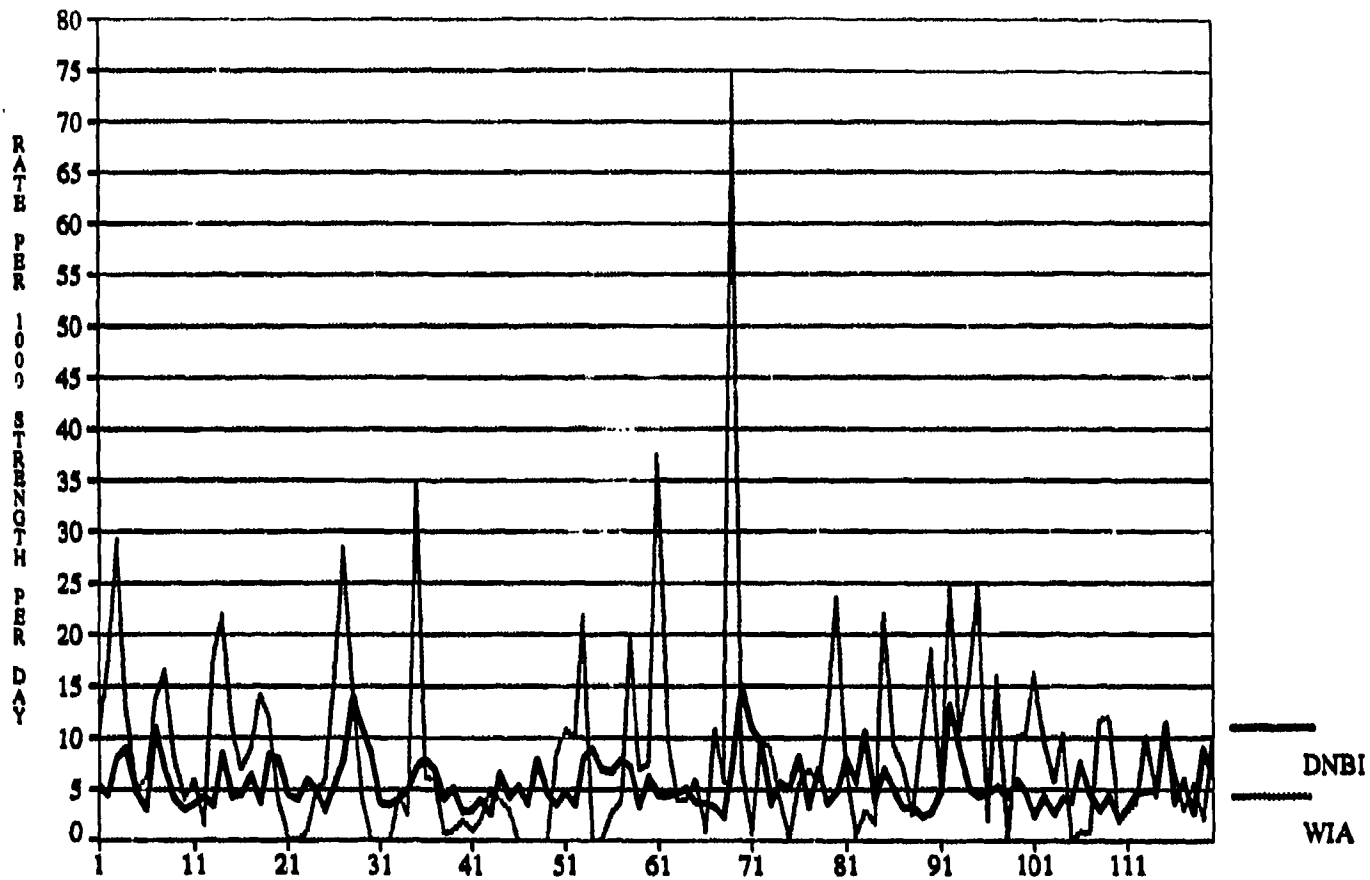
A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by Marine infantry units fighting a moderate-intensity conflict in Europe



A 120 DAY PERIOD OF AN OPERATION

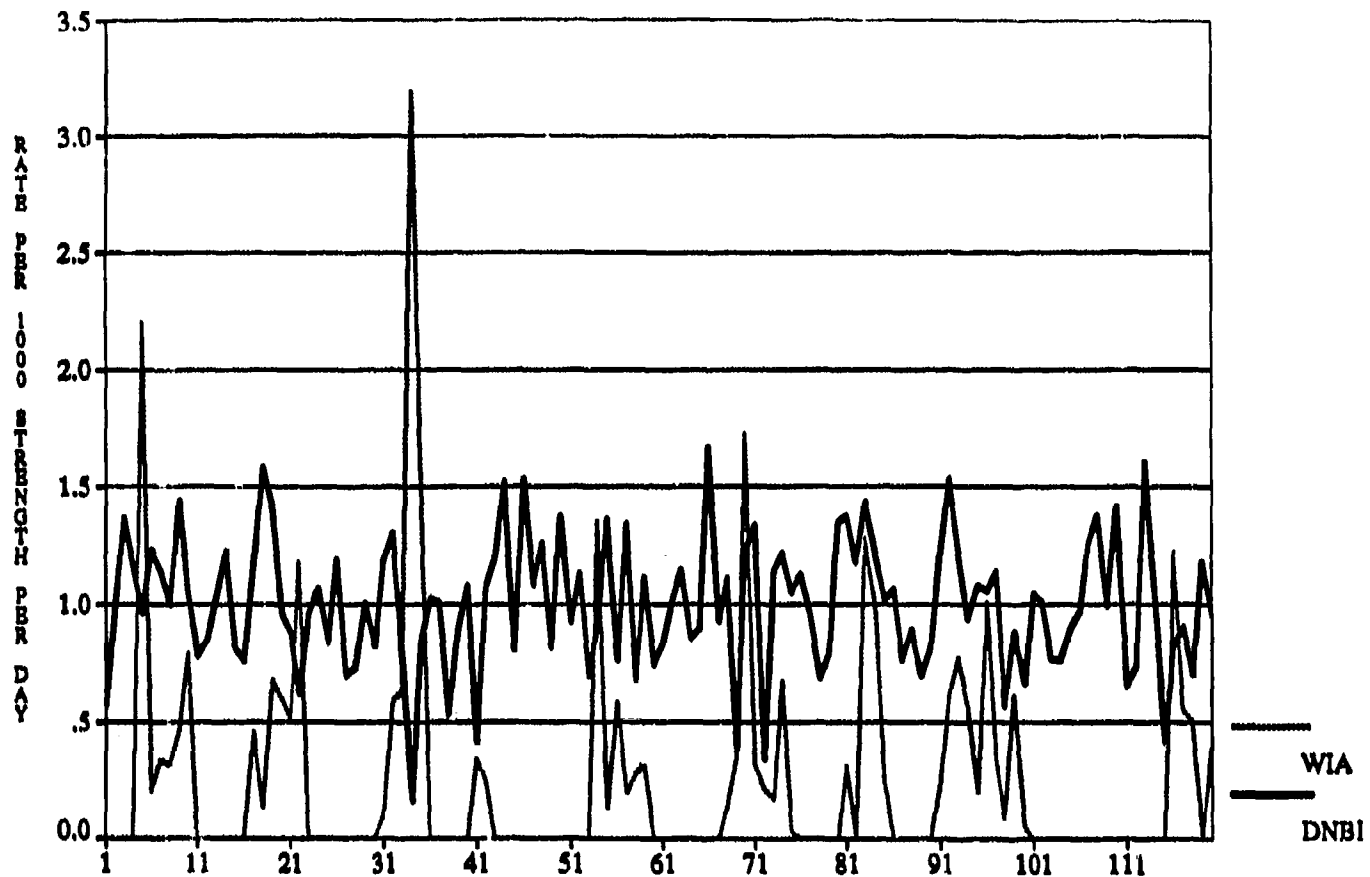
Projected rates of WIA and DNBI admissions incurred by Marine infantry units fighting a heavy-intensity conflict in Europe



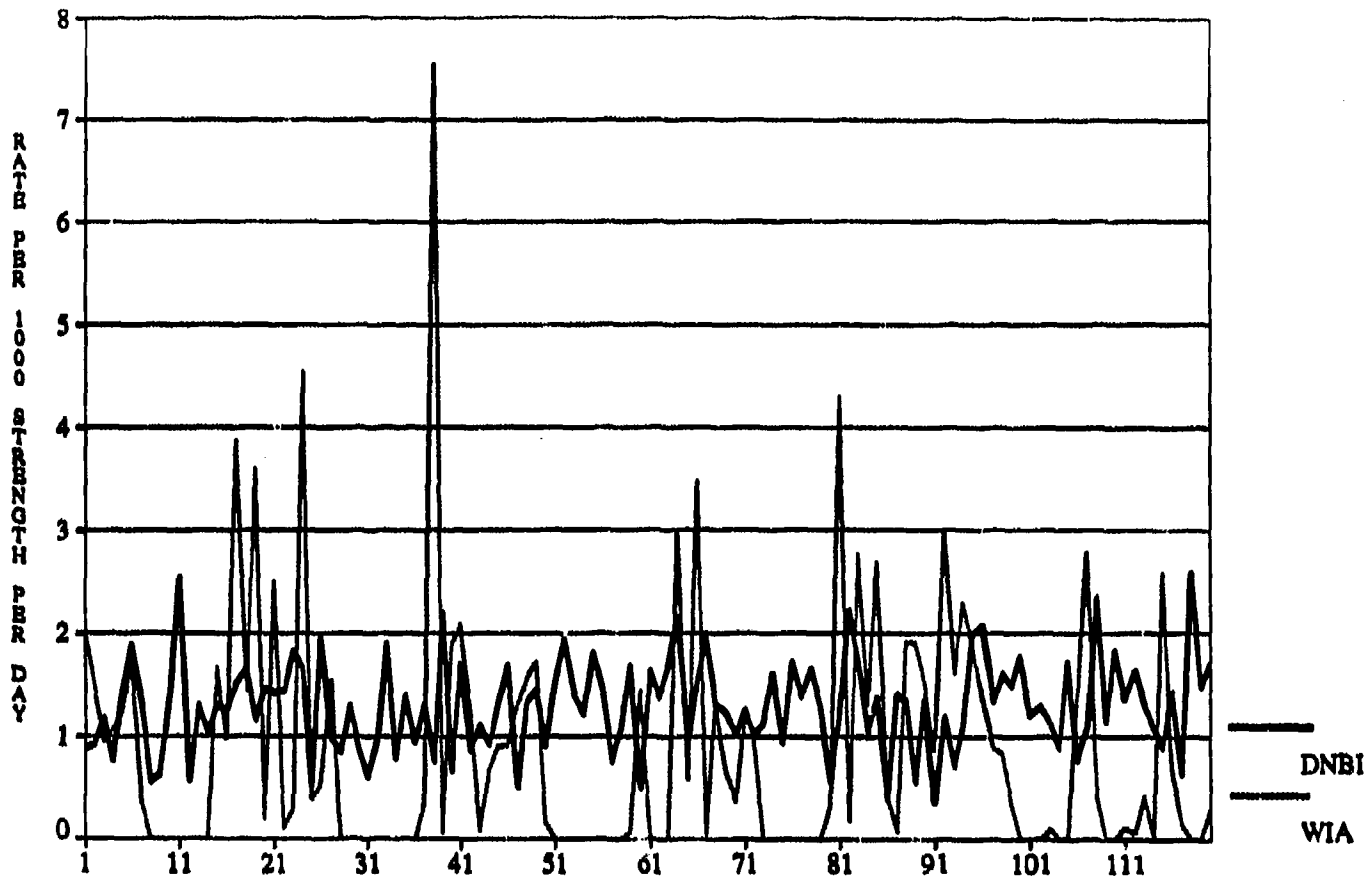
A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by Marine infantry units fighting an 'intense' level conflict in Europe



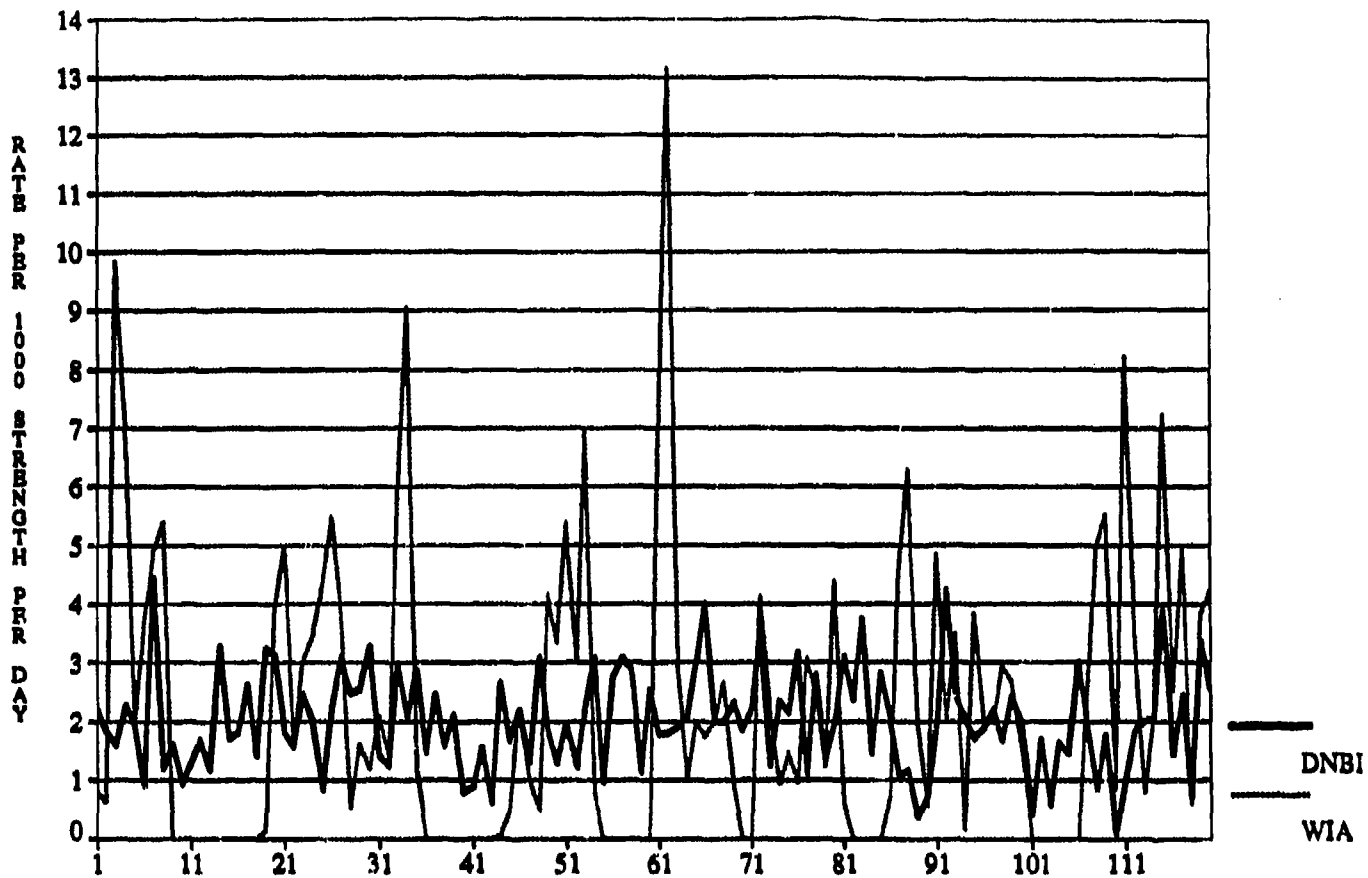


**A 120 DAY PERIOD OF AN OPERATION**  
**Projected rates of WIA and DNBI admissions incurred by a Marine Division**  
**and supporting troops fighting a light-intensity conflict in Europe**



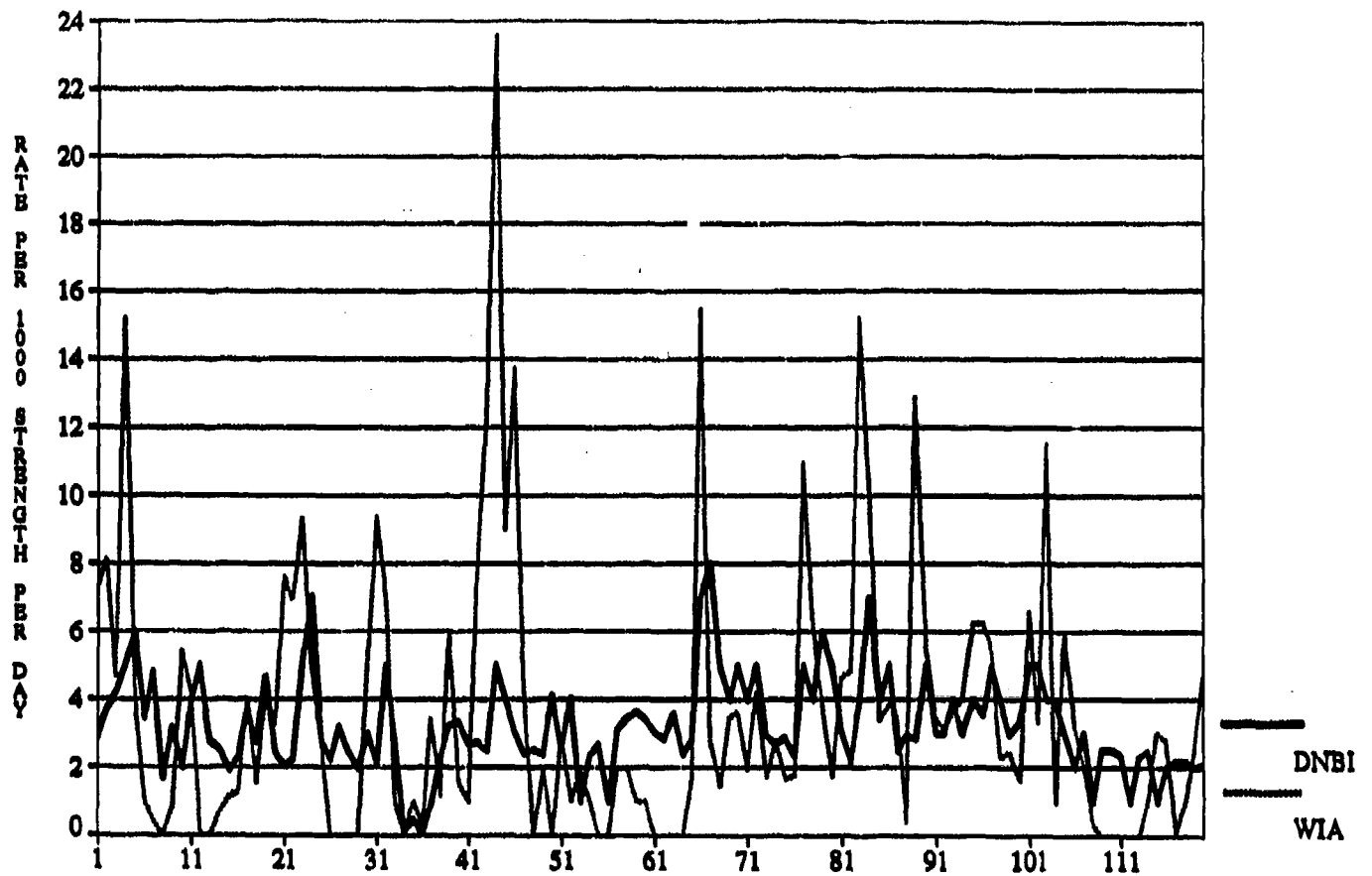
A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by a Marine Division and supporting troops fighting a moderate-intensity conflict in Europe



A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by a Marine Division and supporting troops fighting a heavy-intensity conflict in Europe



A 120 DAY PERIOD OF AN OPERATION

Projected rates of WIA and DNBI admissions incurred by a Marine Division and supporting troops fighting an 'intense' level conflict in Europe

## Appendix D

## FORMULAS

**Symbols:**

- WDNBI = Weighted DNBI rate
- WWIA = Weighted WIA rate
- WKIA = Weighted KIA rate
- %ADM = Percentage of patient presentations admitted to treatment facility
- DAYS = Mandays
- no combat = No combat intensity level
- low = Low combat intensity level
- mod = Moderate combat intensity level
- heavy = Heavy combat intensity level
- intense = Intense combat intensity level
- taing = Infantry regiments, Taingtao, China
- japan = Sasebo, Japan occupation troops
- viethq = Vietnam, Headquarters Company
- koreacom = Combat troops, Korea
- koreasup = Support troops, Korea
- okinsup = Support troops, Okinawa
- okinlow = Low intensity, Okinawa combat troops
- okinmod = Moderate intensity, Okinawa combat troops
- okinheavy = Heavy intensity, Okinawa combat troops
- okintot = Overall, Okinawa combat troops
- viet = Vietnam, combat troops
- viethue = Tet offensive, Vietnam, Hue
- falk = Falklands ground troops

### Combat

$$\begin{aligned} \text{WDNBI}_{\text{taing}} &= (\text{DNBI}_{\text{taing}})(\% \text{ADM}_{\text{taing}})(\text{DAYS}_{\text{taing}} / \text{DAYS}_{\text{taing}+\text{japan}}) \\ \text{WDNBI}_{\text{japan}} &= (\text{DNBI}_{\text{japan}})(\% \text{ADM}_{\text{japan}})(\text{DAYS}_{\text{japan}} / \text{DAYS}_{\text{taing}+\text{japan}}) \\ \text{WDNBI}_{\text{no combat}} &= \text{WDNBI}_{\text{taing}} + \text{WDNBI}_{\text{japan}} \end{aligned}$$

$$\begin{aligned} \text{WWIA}_{\text{taing}} &= (\text{WIA}_{\text{taing}})(\% \text{ADM}_{\text{taing}})(\text{DAYS}_{\text{taing}} / \text{DAYS}_{\text{taing}+\text{japan}}) \\ \text{WWIA}_{\text{japan}} &= (\text{WIA}_{\text{japan}})(\% \text{ADM}_{\text{japan}})(\text{DAYS}_{\text{japan}} / \text{DAYS}_{\text{taing}+\text{japan}}) \\ \text{WWIA}_{\text{no combat}} &= \text{WWIA}_{\text{taing}} + \text{WWIA}_{\text{japan}} \end{aligned}$$

$$\begin{aligned} \text{WKIA}_{\text{taing}} &= (\text{KIA}_{\text{taing}})(\text{DAYS}_{\text{taing}} / \text{DAYS}_{\text{taing}+\text{japan}}) \\ \text{WKIA}_{\text{japan}} &= (\text{KIA}_{\text{japan}})(\text{DAYS}_{\text{japan}} / \text{DAYS}_{\text{taing}+\text{japan}}) \\ \text{WKIA}_{\text{no combat}} &= \text{WKIA}_{\text{taing}} + \text{WKIA}_{\text{japan}} \end{aligned}$$

$$\begin{aligned} \text{WDNBI}_{\text{viet}} &= (\text{DNBI}_{\text{viet}})(\% \text{ADM}_{\text{viet}})(\text{DAYS}_{\text{viet}} / \text{DAYS}_{\text{viet}+\text{falk}+\text{okinlow}}) \\ \text{WDNBI}_{\text{falk}} &= (\text{DNBI}_{\text{falk}})(\% \text{ADM}_{\text{falk}})(\text{DAYS}_{\text{falk}} / \text{DAYS}_{\text{viet}+\text{falk}+\text{okinlow}}) \\ \text{WDNBI}_{\text{okinlow}} &= (\text{DNBI}_{\text{okinlow}})(\% \text{ADM}_{\text{okinlow}})(\text{DAYS}_{\text{okinlow}} / \text{DAYS}_{\text{viet}+\text{falk}+\text{okinlow}}) \\ \text{WDNBI}_{\text{low}} &= \text{WDNBI}_{\text{viet}} + \text{WDNBI}_{\text{falk}} + \text{WDNBI}_{\text{okinlow}} \end{aligned}$$

$$\begin{aligned} \text{WWIA}_{\text{viet}} &= (\text{WIA}_{\text{viet}})(\% \text{ADM}_{\text{viet}})(\text{DAYS}_{\text{viet}} / \text{DAYS}_{\text{viet}+\text{falk}+\text{okinlow}}) \\ \text{WWIA}_{\text{falk}} &= (\text{WIA}_{\text{falk}})(\% \text{ADM}_{\text{falk}})(\text{DAYS}_{\text{falk}} / \text{DAYS}_{\text{viet}+\text{falk}+\text{okinlow}}) \\ \text{WWIA}_{\text{okinlow}} &= (\text{WIA}_{\text{okinlow}})(\% \text{ADM}_{\text{okinlow}})(\text{DAYS}_{\text{okinlow}} / \text{DAYS}_{\text{viet}+\text{falk}+\text{okinlow}}) \\ \text{WWIA}_{\text{low}} &= \text{WWIA}_{\text{viet}} + \text{WWIA}_{\text{falk}} + \text{WWIA}_{\text{okinlow}} \end{aligned}$$

$$\begin{aligned} \text{WKIA}_{\text{viet}} &= (\text{KIA}_{\text{viet}})(\text{DAYS}_{\text{viet}} / \text{DAYS}_{\text{viet}+\text{falk}+\text{okinlow}}) \\ \text{WKIA}_{\text{falk}} &= (\text{KIA}_{\text{falk}})(\text{DAYS}_{\text{falk}} / \text{DAYS}_{\text{viet}+\text{falk}+\text{okinlow}}) \\ \text{WKIA}_{\text{okinlow}} &= (\text{KIA}_{\text{okinlow}})(\text{DAYS}_{\text{okinlow}} / \text{DAYS}_{\text{viet}+\text{falk}+\text{okinlow}}) \\ \text{WKIA}_{\text{low}} &= \text{WKIA}_{\text{viet}} + \text{WKIA}_{\text{falk}} + \text{WKIA}_{\text{okinlow}} \end{aligned}$$

$$\begin{aligned} \text{WDNBI}_{\text{koreacom}} &= (\text{DNBI}_{\text{koreacom}})(\% \text{ADM}_{\text{koreacom}})(\text{DAYS}_{\text{koreacom}} / \text{DAYS}_{\text{koreacom}+\text{viet}+\text{falk}+\text{okinmod}}) \\ \text{WDNBI}_{\text{viet}} &= (\text{DNBI}_{\text{viet}})(\% \text{ADM}_{\text{viet}})(\text{DAYS}_{\text{viet}} / \text{DAYS}_{\text{koreacom}+\text{viet}+\text{falk}+\text{okinmod}}) \\ \text{WDNBI}_{\text{falk}} &= (\text{DNBI}_{\text{falk}})(\% \text{ADM}_{\text{falk}})(\text{DAYS}_{\text{falk}} / \text{DAYS}_{\text{koreacom}+\text{viet}+\text{falk}+\text{okinmod}}) \\ \text{WDNBI}_{\text{okinmod}} &= (\text{DNBI}_{\text{okinmod}})(\% \text{ADM}_{\text{okinmod}})(\text{DAYS}_{\text{okinmod}} / \text{DAYS}_{\text{koreacom}+\text{viet}+\text{falk}+\text{okinmod}}) \end{aligned}$$

$$\begin{aligned}
 WWIA_{koreacom} &= (WIA_{koreacom})(\%ADM_{koreacom})(DAYS_{koreacom}/DAYS_{koreacom+viet+falk+okinmod}) \\
 WWIA_{viet} &= (WIA_{viet})(\%ADM_{viet})(DAYS_{viet}/DAYS_{koreacom+viet+falk+okinmod}) \\
 WWIA_{falk} &= (WIA_{falk})(\%ADM_{falk})(DAYS_{falk}/DAYS_{koreacom+viet+falk+okinmod}) \\
 WWIA_{okinmod} &= (WIA_{okinmod})(\%ADM_{okinmod})(DAYS_{okinmod}/DAYS_{koreacom+viet+falk+okinmod}) \\
 WWIA_{mod} &= WWIA_{koreacom} + WWIA_{viet} + WWIA_{falk} + WWIA_{okinmod}
 \end{aligned}$$

$$\begin{aligned}
 WKIA_{koreacom} &= (KIA_{koreacom})(DAYS_{koreacom}/DAYS_{koreacom+viet+falk+okinmod}) \\
 WKIA_{viet} &= (KIA_{viet})(DAYS_{viet}/DAYS_{koreacom+viet+falk+okinmod}) \\
 WKIA_{falk} &= (KIA_{falk})(DAYS_{falk}/DAYS_{koreacom+viet+falk+okinmod}) \\
 WKIA_{okinmod} &= (KIA_{okinmod})(DAYS_{okinmod}/DAYS_{koreacom+viet+falk+okinmod}) \\
 WKIA_{mod} &= WKIA_{koreacom} + WKIA_{viet} + WKIA_{falk} + WKIA_{okinmod}
 \end{aligned}$$

$$\begin{aligned}
 WDNBI_{okintot} &= (DNBI_{okintot})(\%ADM_{okintot})(DAYS_{okintot}/DAYS_{okintot+okinmod}) \\
 WDNBI_{okinmod} &= (DNBI_{okinmod})(\%ADM_{okinmod})(DAYS_{okinmod}/DAYS_{okintot+okinmod}) \\
 WDNBI_{heavy} &= WDNBI_{okintot} + WDNBI_{okinmod}
 \end{aligned}$$

$$\begin{aligned}
 WWIA_{okintot} &= (WIA_{okintot})(\%ADM_{okintot})(DAYS_{okintot}/DAYS_{okintot+okinmod}) \\
 WWIA_{okinmod} &= (WIA_{okinmod})(\%ADM_{okinmod})(DAYS_{okinmod}/DAYS_{okintot+okinmod}) \\
 WWIA_{heavy} &= WWIA_{okintot} + WWIA_{okinmod}
 \end{aligned}$$

$$\begin{aligned}
 WKIA_{okintot} &= (KIA_{okintot})(DAYS_{okintot}/DAYS_{okintot+okinmod}) \\
 WKIA_{okinmod} &= (KIA_{okinmod})(DAYS_{okinmod}/DAYS_{okintot+okinmod}) \\
 WKIA_{heavy} &= WKIA_{okintot} + WKIA_{okinmod}
 \end{aligned}$$

$$\begin{aligned}
 WDNBI_{okintot} &= (DNBI_{okintot})(\%ADM_{okintot})(DAYS_{okintot}/DAYS_{okintot+viethue+okinheavy}) \\
 WDNBI_{viethue} &= (DNBI_{viethue})(\%ADM_{viethue})(DAYS_{viethue}/DAYS_{okintot+viethue+okinheavy}) \\
 WDNBI_{okinheavy} &= (DNBI_{okinheavy})(\%ADM_{okinheavy})(DAYS_{okinheavy}/DAYS_{okintot+viethue+okinheavy}) \\
 WDNBI_{intense} &= WDNBI_{okintot} + WDNBI_{viethue} + WDNBI_{okinheavy}
 \end{aligned}$$

$$\begin{aligned}
 WWIA_{okintot} &= (WIA_{okintot})(\%ADM_{okintot})(DAYS_{okintot}/DAYS_{okintot+viethue+okinheavy}) \\
 WWIA_{viethue} &= (WIA_{viethue})(\%ADM_{viethue})(DAYS_{viethue}/DAYS_{okintot+viethue+okinheavy}) \\
 WWIA_{okinheavy} &= (WIA_{okinheavy})(\%ADM_{okinheavy})(DAYS_{okinheavy}/DAYS_{okintot+viethue+okinheavy}) \\
 WWIA_{intense} &= WWIA_{okintot} + WWIA_{viethue} + WWIA_{okinheavy}
 \end{aligned}$$

$$\begin{aligned}
 WKIA_{okintot} &= (KIA_{okintot})(DAYS_{okintot}/DAYS_{okintot+viethue+okinheavy}) \\
 WKIA_{viethue} &= (KIA_{viethue})(DAYS_{viethue}/DAYS_{okintot+viethue+okinheavy}) \\
 WKIA_{okinheavy} &= (KIA_{okinheavy})(DAYS_{okinheavy}/DAYS_{okintot+viethue+okinheavy}) \\
 WKIA_{intense} &= WKIA_{okintot} + WKIA_{viethue} + WKIA_{okinheavy}
 \end{aligned}$$

### Support

$$\begin{aligned}
 WDNBI_{tsing} &= (DNBI_{tsing})(\%ADM_{tsing})(DAYS_{tsing}/DAYS_{tsing+japan}) \\
 WDNBI_{japan} &= (DNBI_{japan})(\%ADM_{japan})(DAYS_{japan}/DAYS_{tsing+japan}) \\
 WDNBI_{no combat} &= WDNBI_{tsing} + WDNBI_{japan}
 \end{aligned}$$

$$\begin{aligned}
 WWIA_{tsing} &= (WIA_{tsing})(\%ADM_{tsing})(DAYS_{tsing}/DAYS_{tsing+japan}) \\
 WWIA_{japan} &= (WIA_{japan})(\%ADM_{japan})(DAYS_{japan}/DAYS_{tsing+japan}) \\
 WWIA_{no combat} &= WWIA_{tsing} + WWIA_{japan}
 \end{aligned}$$

$$\begin{aligned}
 WKIA_{tsing} &= (KIA_{tsing})(DAYS_{tsing}/DAYS_{tsing+japan}) \\
 WKIA_{japan} &= (KIA_{japan})(DAYS_{japan}/DAYS_{tsing+japan}) \\
 WKIA_{no combat} &= WKIA_{tsing} + WKIA_{japan}
 \end{aligned}$$

$$\begin{aligned}
 WDNBI_{tsing} &= (DNBI_{tsing})(\%ADM_{tsing})(DAYS_{tsing}/DAYS_{tsing+japan+viethq}) \\
 WDNBI_{japan} &= (DNBI_{japan})(\%ADM_{japan})(DAYS_{japan}/DAYS_{tsing+japan+viethq}) \\
 WDNBI_{viethq} &= (DNBI_{viethq})(\%ADM_{viethq})(DAYS_{viethq}/DAYS_{tsing+japan+viethq}) \\
 WDNBI_{low} &= WDNBI_{tsing} + WDNBI_{japan} + WDNBI_{viethq}
 \end{aligned}$$

$$\begin{aligned}
WWIA_{tsing} &= (WIA_{tsing})(\%ADM_{tsing})(DAYS_{tsing}/DAYS_{tsing+japan+vietiq}) \\
WWIA_{japan} &= (WIA_{japan})(\%ADM_{japan})(DAYS_{japan}/DAYS_{tsing+japan+vietiq}) \\
WWIA_{vietiq} &= (WIA_{vietiq})(\%ADM_{vietiq})(DAYS_{vietiq}/DAYS_{tsing+japan+vietiq}) \\
WWIA_{low} &= WWIA_{tsing} + WWIA_{japan} + WWIA_{vietiq}
\end{aligned}$$

$$\begin{aligned}
WKIA_{tsing} &= (KIA_{tsing})(DAYS_{tsing}/DAYS_{tsing+japan+vietiq}) \\
WKIA_{japan} &= (KIA_{japan})(DAYS_{japan}/DAYS_{tsing+japan+vietiq}) \\
WKIA_{vietiq} &= (KIA_{vietiq})(DAYS_{vietiq}/DAYS_{tsing+japan+vietiq}) \\
WKIA_{low} &= WKIA_{tsing} + WKIA_{japan} + WKIA_{vietiq}
\end{aligned}$$

$$\begin{aligned}
WDNBI_{koreasup} &= (DNBI_{koreasup})(\%ADM_{koreasup})(DAYS_{koreasup}/DAYS_{koreasup+okinsup}) \\
WDNBI_{okinsup} &= (DNBI_{okinsup})(\%ADM_{okinsup})(DAYS_{okinsup}/DAYS_{koreasup+okinsup}) \\
WDNBI_{mod} &= WDNBI_{koreasup} + WDNBI_{okinsup}
\end{aligned}$$

$$\begin{aligned}
WWIA_{koreasup} &= (WIA_{koreasup})(\%ADM_{koreasup})(DAYS_{koreasup}/DAYS_{koreasup+okinsup}) \\
WWIA_{okinsup} &= (WIA_{okinsup})(\%ADM_{okinsup})(DAYS_{okinsup}/DAYS_{koreasup+okinsup}) \\
WWIA_{mod} &= WWIA_{koreasup} + WWIA_{okinsup}
\end{aligned}$$

$$\begin{aligned}
WKIA_{koreasup} &= (KIA_{koreasup})(DAYS_{koreasup}/DAYS_{koreasup+okinsup}) \\
WKIA_{okinsup} &= (KIA_{okinsup})(DAYS_{okinsup}/DAYS_{koreasup+okinsup}) \\
WKIA_{mod} &= WKIA_{koreasup} + WKIA_{okinsup}
\end{aligned}$$

$$\begin{aligned}
WDNBI_{koreasup} &= (DNBI_{koreasup})(\%ADM_{koreasup})(DAYS_{koreasup}/DAYS_{koreasup+okinsup+okinlow}) \\
WDNBI_{okinsup} &= (DNBI_{okinsup})(\%ADM_{okinsup})(DAYS_{okinsup}/DAYS_{koreasup+okinsup+okinlow}) \\
WDNBI_{okinlow} &= (DNBI_{okinlow})(\%ADM_{okinlow})(DAYS_{okinlow}/DAYS_{koreasup+okinsup+okinlow}) \\
WDNBI_{heavy} &= WDNBI_{koreasup} + WDNBI_{okinsup} + WDNBI_{okinlow}
\end{aligned}$$

$$\begin{aligned}
WWIA_{koreasup} &= (WIA_{koreasup})(\%ADM_{koreasup})(DAYS_{koreasup}/DAYS_{koreasup+okinsup+okinlow}) \\
WWIA_{okinsup} &= (WIA_{okinsup})(\%ADM_{okinsup})(DAYS_{okinsup}/DAYS_{koreasup+okinsup+okinlow}) \\
WWIA_{okinlow} &= (WIA_{okinlow})(\%ADM_{okinlow})(DAYS_{okinlow}/DAYS_{koreasup+okinsup+okinlow}) \\
WWIA_{heavy} &= WWIA_{koreasup} + WWIA_{okinsup} + WWIA_{okinlow}
\end{aligned}$$

$$\begin{aligned}
WKIA_{koreasup} &= (KIA_{koreasup})(DAYS_{koreasup}/DAYS_{koreasup+okinsup+okinlow}) \\
WKIA_{okinsup} &= (KIA_{okinsup})(DAYS_{okinsup}/DAYS_{koreasup+okinsup+okinlow}) \\
WKNBI_{okinlow} &= (DNBI_{okinlow})(DAYS_{okinlow}/DAYS_{koreasup+okinsup+okinlow}) \\
WKIA_{heavy} &= WKIA_{koreasup} + WKIA_{okinsup} + WKIA_{okinlow}
\end{aligned}$$

$$\begin{aligned}
WDNBI_{koreasup} &= (DNBI_{koreasup})(\%ADM_{koreasup})(DAYS_{koreasup}/DAYS_{koreasup+okinsup+okinmod}) \\
WDNBI_{okinsup} &= (DNBI_{okinsup})(\%ADM_{okinsup})(DAYS_{okinsup}/DAYS_{koreasup+okinsup+okinmod}) \\
WDNBI_{okinmod} &= (DNBI_{okinmod})(\%ADM_{okinmod})(DAYS_{okinmod}/DAYS_{koreasup+okinsup+okinmod}) \\
WDNBI_{intense} &= WDNBI_{koreasup} + WDNBI_{okinsup} + WDNBI_{okinmod}
\end{aligned}$$

$$\begin{aligned}
WWIA_{koreasup} &= (WIA_{koreasup})(\%ADM_{koreasup})(DAYS_{koreasup}/DAYS_{koreasup+okinsup+okinmod}) \\
WWIA_{okinsup} &= (WIA_{okinsup})(\%ADM_{okinsup})(DAYS_{okinsup}/DAYS_{koreasup+okinsup+okinmod}) \\
WWIA_{okinmod} &= (WIA_{okinmod})(\%ADM_{okinmod})(DAYS_{okinmod}/DAYS_{koreasup+okinsup+okinmod}) \\
WWIA_{intense} &= WWIA_{koreasup} + WWIA_{okinsup} + WWIA_{okinmod}
\end{aligned}$$

$$\begin{aligned}
WKIA_{koreasup} &= (KIA_{koreasup})(DAYS_{koreasup}/DAYS_{koreasup+okinsup+okinmod}) \\
WKIA_{okinsup} &= (KIA_{okinsup})(DAYS_{okinsup}/DAYS_{koreasup+okinsup+okinmod}) \\
WKIA_{okinmod} &= (KIA_{okinmod})(DAYS_{okinmod}/DAYS_{koreasup+okinsup+okinmod}) \\
WKIA_{intense} &= WKIA_{koreasup} + WKIA_{okinsup} + WKIA_{okinmod}
\end{aligned}$$



WEIGHTED DNBI, WIA, KIA RATES ACROSS INTENSITIES

Legend

%ADM = Percent of presentations admitted to treatment facility  
 DAYS = Total number of mandays across all component scenarios  
 %DAYS= Percent of total mandays represented by specific scenario

Weighted Intensity Rate =  $\Sigma(\text{Component Presentation Rate} \times \%ADM \times \%DAYS)$

**COMBAT**

	DNBI RATE	%ADM	WIA RATE	%ADM	KIA RATE	DAYS	%DAYS	WEIGHTED RATES		
								DNBI	WIA	KIA
<b><u>No Combat</u></b>										
Tsingtao	1.88	.85	-0-	---	-0-	551756	.577	.92	---	---
Japan	.73	.85	-0-	---	-0-	403758	.423	.26	---	---
								<u>1.18</u>		
<b><u>Light</u></b>										
Vietnam	1.78	.88	2.50	.64	.31	205186	.313	.49	.50	.10
Falklands	1.27	.78	1.86	.99	.71	168609	.257	.25	.47	.18
Okin Low	<u>2.26</u>	<u>.88</u>	<u>1.00</u>	<u>.84</u>	<u>.22</u>	<u>281327</u>	<u>.429</u>	<u>.85</u>	<u>.36</u>	<u>.09</u>
								<u>1.59</u>	<u>1.33</u>	<u>.37</u>
<b><u>Moderate</u></b>										
Korea Com	3.31	.79	2.75	.62	.20	625209	.501	1.31	.85	.10
Vietnam	1.78	.88	2.50	.64	.31	205186	.164	.26	.26	.02
Falklands	1.27	.78	1.86	.99	.71	168609	.135	.13	.25	.10
Okin Mod	<u>5.96</u>	<u>.88</u>	<u>8.31</u>	<u>.84</u>	<u>1.92</u>	<u>248814</u>	<u>.199</u>	<u>1.04</u>	<u>1.39</u>	<u>.38</u>
								<u>2.74</u>	<u>2.75</u>	<u>.60</u>
<b><u>Heavy</u></b>										
Okin Tot	4.56	.88	6.57	.84	1.35	1224150	.831	3.33	4.59	1.12
Okin Mod	<u>5.96</u>	<u>.88</u>	<u>8.31</u>	<u>.84</u>	<u>1.92</u>	<u>248814</u>	<u>.169</u>	<u>.89</u>	<u>1.18</u>	<u>.32</u>
								<u>4.22</u>	<u>5.77</u>	<u>1.44</u>
<b><u>Intense</u></b>										
Okin Tot	4.56	.88	6.57	.84	1.35	1224150	.836	3.36	4.61	1.13
Viet-Hue	1.23	.88	41.16	.64	5.58	12194	.008	.01	.21	.04
Okin Heavy	<u>9.48</u>	<u>.88</u>	<u>21.50</u>	<u>.84</u>	<u>5.33</u>	<u>228584</u>	<u>.156</u>	<u>1.30</u>	<u>2.82</u>	<u>.83</u>
								<u>4.67</u>	<u>7.64</u>	<u>2.00</u>

WEIGHTED DNBI, WIA, KIA RATES ACROSS INTENSITIES

**Legend**

%ADM = Percent of presentations admitted to treatment facility  
 DAYS = Total number of mandays across all component scenarios  
 %DAYS= Percent of total mandays represented by specific scenario

Weighted Intensity Rate =  $\Sigma(\text{Component Presentation Rate} \times \%ADM \times \%DAYS)$

**SUPPORT**

	DNBI RATE	%ADM	WIA RATE	%ADM	KIA RATE	DAYS	%DAYS	WEIGHTED RATES		
								DNBI	WIA	KIA
<b><u>No Combat</u></b>										
Tsingtao	1.88	.85	-0-	---	-0-	551756	.577	.92	---	---
<u>Japan</u>	<u>.73</u>	<u>.85</u>	<u>-0-</u>	<u>---</u>	<u>-0-</u>	<u>403758</u>	<u>.423</u>	<u>.26</u>	<u>---</u>	<u>---</u>
								<u>1.18</u>		
<b><u>Light</u></b>										
Tsingtao	1.88	.85	-0-	---	-0-	551756	.561	.88	-0-	-0-
Japan	.73	.85	-0-	---	-0-	403758	.411	.26	-0-	-0-
<u>Viet HQ</u>	<u>1.18</u>	<u>.88</u>	<u>.33</u>	<u>.64</u>	<u>-0-</u>	<u>27016</u>	<u>.027</u>	<u>.03</u>	<u>.01</u>	<u>-0-</u>
								<u>1.17</u>	<u>.01</u>	<u>-0-</u>
<b><u>Moderate</u></b>										
Korea Sup	.76	.93	.10	.56	.01	1134036	.635	.45	.04	.01
<u>Okin Sup</u>	<u>.93</u>	<u>.85</u>	<u>.43</u>	<u>.68</u>	<u>.09</u>	<u>650898</u>	<u>.365</u>	<u>.29</u>	<u>.11</u>	<u>.03</u>
								<u>.74</u>	<u>.15</u>	<u>.04</u>
<b><u>Heavy</u></b>										
Korea Sup	.76	.93	.10	.56	.01	1134036	.549	.39	.03	.01
Okin Sup	.93	.85	.43	.68	.09	650898	.315	.25	.09	.03
<u>Okin Light</u>	<u>2.26</u>	<u>.88</u>	<u>1.00</u>	<u>.84</u>	<u>.22</u>	<u>281327</u>	<u>.136</u>	<u>.27</u>	<u>.11</u>	<u>.03</u>
								<u>.91</u>	<u>.23</u>	<u>.07</u>
<b><u>Intense</u></b>										
Korea Sup	.76	.93	.10	.56	.01	1134036	.558	.01	.03	.01
Okin Sup	.93	.85	.43	.68	.09	650898	.320	.25	.09	.03
<u>Okin Mod</u>	<u>5.96</u>	<u>.88</u>	<u>8.31</u>	<u>.84</u>	<u>1.92</u>	<u>248814</u>	<u>.122</u>	<u>.64</u>	<u>.85</u>	<u>.23</u>
								<u>1.28</u>	<u>.97</u>	<u>.27</u>

# Appendix E

## IMPACT OF TERRAIN AND WEATHER ON CASUALTY RATES (FROM DUPUY)

### Terrain Factors

1.	Rugged, heavily wooded	0.30
2.	Rugged, mixed (extra-rugged, bare)	0.40
3.	Rugged, bare	0.50
4.	Rolling foothills, heavily wooded	0.60
5.	Rolling foothills, mixed	0.70
6.	Rolling foothills, bare	0.80
7.	Rolling gentle, heavily wooded	0.65
8.	Rolling gentle, mixed	0.75
9.	Rolling gentle, bare	0.85
10.	Flat, heavily wooded	0.70
11.	Flat, mixed	0.80
12.	Flat, bare, hard	1.00
13.	Flat, desert	0.90
14.	Rolling dunes	0.50
15.	Swamp, jungle	0.30
16.	Swamp, mixed, or open	0.40
17.	Urban	0.50

### Weather Factors

1.	Dry, sunshine, extreme heat	0.8
2.	Dry, sunshine, temperate	1.0
3.	Dry, sunshine, extreme cold	0.7
4.	Dry, overcast, extreme heat	0.9
5.	Dry, overcast, temperate	1.0
6.	Dry, overcast, extreme cold	0.6
7.	Wet, light, extreme heat	0.7
8.	Wet, light, temperate	0.7
9.	Wet, light, extreme cold	0.4
10.	Wet, heavy, extreme heat	0.5
11.	Wet, heavy, temperate	0.5
12.	Wet, heavy, extreme cold	0.3

### Eastern Asia Terrain

<u>Country</u>	<u>Description of Factor</u>	<u>Numeric Factor</u>	<u>Points</u>
N. Korea	Rugged, mixed	.40	
	Rolling foothills, mixed	.70	
	Flat, mixed	.80	1.9
S. Korea	Rugged, mixed	.40	
	Rolling foothills, mixed	.70	1.1
Vietnam	Rugged, heavily wooded	.30	
	Rugged, mixed	.40	
	Rolling foothills heavily wooded	.60	
	Flat, mixed	.80	
	Swamp, jungle	.30	
	Swamp, mixed, or open	.40	
	Swamp, mixed, or open	.40	3.2
Okinawa	Rugged, mixed	.40	.4
Total Eastern Asia			6.6

### Southwestern Asia Terrain

<u>Country</u>	<u>Description of Factor</u>	<u>Numeric Factor</u>	<u>Points</u>
Iraq	Flat, desert	.90	
	Flat, desert	.90	
	Flat, desert	.90	
	Rugged, bare	.50	
	Flat, bare, hard	1.00	
	Swamp, mixed, open	.40	4.6
Iran	Flat, desert	.90	
	Flat, desert	.90	
	Flat, bare, hard	1.00	
	Rugged, mixed	.40	3.2
Total Southwestern Asia			7.8

### Eastern Asia Weather

<u>Country</u>	<u>Description of Factor</u>	<u>Numeric Factor</u>	<u>Points</u>
N. Korea	Dry, sunshine, temperate	1.0	
	Dry, overcast, extreme cold	.6	
	Wet, light, extreme cold	.4	
	Wet, heavy, temperate	.5	2.5
S. Korea	Dry, sunshine, extreme cold	.7	
	Dry, overcast, temperate	1.0	
	Wet, light, temperate	.7	
	Wet, heavy, temperate	.5	2.9
Vietnam	Wet, heavy, extreme heat	.5	
	Wet, heavy, extreme heat	.5	
	Wet, heavy, temperate	.5	
	Wet, heavy, temperate	.5	
	Dry, overcast, extreme heat	.9	
	Dry, overcast, temperate	1.0	
	Dry, overcast, temperate	1.0	4.9
Okinawa	Dry, sunshine, temperate	1.0	
	Wet, heavy, temperate	.5	
	Wet, light, temperate	.7	2.2
Total Eastern Asia			12.5

### Southwest Asia Weather

<u>Country</u>	<u>Description of Factor</u>	<u>Numeric Factor</u>	<u>Points</u>
Iraq	Dry, sunshine, extreme heat	.8	
	Dry, sunshine, extreme heat	.8	
	Wet, light, temperate	.7	
	Dry, sunshine, temperate	1.0	3.3
Iran	Dry, sunshine, extreme heat	.8	
	Dry, sunshine, extreme heat	.8	
	Dry, overcast, temperate	1.0	
	Wet, light, temperate	.7	3.3
Total Southwest Asia			6.6

Summary of Assigned Terrain and Weather Factors

Terrain

<u>East Asia</u>			<u>Southwest Asia</u>		
	<u>points</u>	<u># factors</u>		<u>points</u>	<u># factors</u>
N. Korea	1.9	3	Iran	3.2	4
S. Korea	1.1	2	Iraq	4.6	6
Vietnam	3.2	7	Total	7.8	10
Okinawa	.4	1			
Total	6.6	13			

$$6.6/13 = .51$$

$$7.8/10 = .78$$

$$.78/.51 = \underline{1.53}$$

Weather

<u>East Asia</u>			<u>Southwest Asia</u>		
	<u>points</u>	<u># factors</u>		<u>points</u>	<u># factors</u>
N. Korea	2.5	4	Iran	3.3	4
S. Korea	2.9	4	Iraq	3.3	4
Vietnam	4.9	7	Total	6.6	8
Okinawa	2.2	3			
Total	12.5	18			

$$12.5/18 = .69$$

$$6.6/8 = .82$$

$$.82/.69 = \underline{1.2}$$

Total Terrain and Weather Factor

Terrain factor x Weather factor = Total SW Asia Adjustment Factor

$$1.53 \times 1.2 = \underline{1.836}$$

**Army NBI Rates\* for Southwest Asia (Mideast)**

	<u>Infantry</u>	<u>Divisional Noninfantry</u>	<u>Nondivisional</u>
Mideast	0.38	0.385	0.35

**Army NBI Rates\* for East Asia**

	<u>Infantry</u>	<u>Divisional Noninfantry</u>	<u>Nondivisional</u>
Central and South Pacific	0.28	0.23	0.21
Korea	0.62	0.505	0.40
Vietnam	0.15	0.125	0.15
Overall East Asia	0.3465	0.2837	0.2508

**Conversion Factors: East Asia to Southwest Asia**

	<u>Infantry</u>	<u>Divisional Noninfantry</u>	<u>Nondivisional</u>
Conversion Factor	$0.38/0.347 = 1.097$	$0.385/0.284 = 1.357$	$0.35/0.251 = 1.395$

\* from FM 101-10-1 (staff officers field manual)



## **Appendix F**

European Terrain

<u>Country</u>	<u>Description of Factor</u>	<u>Numeric Factor</u>	<u>Points</u>
Albania	Rugged, mixed	.40	
	Rolling foothills, mixed	.70	
	Flat, mixed	.80	1.9
Austria	Rolling foothills, heavily wooded	.60	
	Flat, mixed	.80	1.4
Bulgaria	Rugged, mixed	.40	
	Rolling gentle, mixed	.75	
	Flat, mixed	.80	1.95
Czech.	Rugged, mixed	.40	
	Rolling foothills, mixed	.70	
	Rolling gentle, mixed	.75	
	Flat, mixed	.80	2.65
Yugo.	Rugged, heavily wooded	.30	
	Rugged, mixed	.40	
	Rugged, mixed	.40	
	Rolling gentle, mixed	.75	
	Flat, heavily wooded	.70	
	Flat, mixed	.80	3.35
Greece	Rugged, mixed	.40	
	Rolling foothills, mixed	.70	
	Flat, mixed	.80	1.9
Hungary	Flat, mixed	.80	
	Rolling dunes	.50	
	Rolling foothills, mixed	.70	2.0
Poland	Flat, mixed	.80	
	Rolling foothills, mixed	.70	
	Rolling gentle, mixed	.75	
	Flat, bare, hard	1.00	3.25
Romania	Rugged, mixed	.40	
	Rolling foothills, mixed	.70	
	Flat, mixed	.80	1.9
Total Europe			20.3

European Weather

<u>Country</u>	<u>Description of Factor</u>	<u>Numeric Factor</u>	<u>Points</u>
Albania	Dry, sunshine, temperate	1.00	2.6
	Wet, light, temperate	.70	
	Wet, light, extreme cold	.40	
	Wet, heavy, temperate	.50	
Austria	Dry, sunshine, temperate	1.00	2.6
	Wet, light, temperate	.70	
	Wet, light, extreme cold	.40	
	Wet, heavy, temperate	.50	
Bulgaria	Dry, sunshine, temperate	1.00	2.7
	Wet, light, temperate	.70	
	Wet, light, extreme cold	.40	
	Dry, overcast, extreme cold	.60	
Czech.	Dry, sunshine, temperate	1.00	3.4
	Wet, light, temperate	.70	
	Wet, light, temperate	.70	
	Dry, overcast, temperate	1.00	
Yugo.	Dry, sunshine, temperate	1.00	3.4
	Wet, light, temperate	.70	
	Wet, light, extreme cold	.40	
	Dry, overcast, temperate	1.00	
	Wet, heavy, extreme cold	.30	
Greece	Dry, sunshine, temperate	1.00	3.4
	Dry, sunshine, temperate	1.00	
	Wet, light, temperate	.70	
	Wet, light, temperate	.70	
Hungary	Dry, sunshine, temperate	1.00	2.7
	Wet, light, temperate	.70	
	Dry, overcast, temperate	1.00	
Poland	Dry, sunshine, temperate	1.00	3.1
	Wet, light, temperate	.70	
	Dry, overcast, temperate	1.00	
	Wet, light, extreme cold	.40	
Romania	Dry, sunshine, temperate	1.00	4.0
	Wet, light, temperate	.70	
	Dry, overcast, temperate	1.00	
	Wet, light, extreme cold	.40	
	Dry, overcast, extreme cold	.60	
	Wet, heavy, extreme cold	.30	
Total Europe			27.9

Summary of Assigned Terrain and Weather Factors

Terrain

<u>Europe</u>			<u>East Asia</u>		
	<u>points</u>	<u># factors</u>		<u>points</u>	<u># factors</u>
Albania	1.9	3	N. Korea	1.9	3
Austria	1.4	2	S. Korea	1.1	2
Bulgaria	1.95	3	Vietnam	3.2	7
Czech.	2.65	4	<u>Okinawa</u>	<u>.4</u>	<u>1</u>
Yugo.	3.35	6	Total	6.6	13
Greece	1.9	3			
Hungary	2.0	3			
Poland	3.25	4			
<u>Romania</u>	<u>1.9</u>	<u>3</u>			
Total	20.3	31			

$$20.3/31 = 0.6548$$

$$6.6/13 = .51$$

$$0.6548/0.51 = \underline{1.284}$$

Weather

<u>Europe</u>			<u>East Asia</u>		
	<u>points</u>	<u># factors</u>		<u>points</u>	<u># factors</u>
Albania	2.6	4	N. Korea	2.5	4
Austria	2.6	4	S. Korea	2.9	4
Bulgaria	2.7	4	Vietnam	4.9	7
Czech.	3.4	4	<u>Okinawa</u>	<u>2.2</u>	<u>3</u>
Yugo.	3.4	5	Total	12.5	18
Greece	3.4	4			
Hungary	2.7	3			
Poland	3.1	4			
<u>Romania</u>	<u>4.0</u>	<u>6</u>			
Total	27.9	38			

$$27.9/38 = 0.7342$$

$$12.5/18 = .69$$

$$0.7342/0.69 = \underline{1.06}$$

Total Terrain and Weather Factor

Terrain factor x Weather factor = Total European Adjustment Factor

$$1.284 \times 1.06 = \underline{1.36}$$

**Army NBI Rates\* for Europe**

	Infantry	Divisional Noninfantry	Nondivisional
Europe	0.5367	0.4111	0.3235

**Army NBI Rates\* for East Asia**

	Infantry	Divisional Noninfantry	Nondivisional
Central and South Pacific	0.28	0.23	0.21
Korea	0.62	0.505	0.40
Vietnam	0.15	0.125	0.15
Overall East Asia	0.3465	0.2837	0.2508

**Conversion Factors: East Asia to Europe**

	Infantry	Divisional Noninfantry	Nondivisional
Conversion Factor	$0.537/0.346 = 1.5489$	$0.411/0.284 = 1.4491$	$0.324/0.251 = 1.2899$

\* from FM 101-10-1 (staff officers field manual)

# REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE November 1994	3. REPORT TYPE AND DATE COVERED Final Oct 91 through Oct 93
4. TITLE AND SUBTITLE PROJECTIONS OF BATTLEFIELD MEDICAL CASUALTIES AMONG U.S. MARINE FORCES FOR VARIOUS THEATERS OF OPERATIONS		5. FUNDING NUMBERS Program Element: 63706N Work Unit Number: M0095.005-6204	
6. AUTHOR(S) Christopher G. Blood, Eleanor D. Gauker, Marlisa E. Anderson, Michael S. Odowick, Edward R. O'Donnell		7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Health Research Center P. O. Box 85122 San Diego, CA 92186-5122	
8. PERFORMING ORGANIZATION Report No. 93-35		9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Naval Medical Research and Development Command National Naval Medical Center Building 1, Tower 2 Bethesda, MD 20889-5044	
10. SPONSORING/MONITORING AGENCY REPORT NUMBER		11. SUPPLEMENTARY NOTES	
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.		12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) Wounded-in-action (WIA), Killed-in-Action (KIA), and disease/nonbattle injury (DNBI) data were extracted from the records of military operations spanning four decades to project casualty and illness rates for various operational scenarios. The resulting empirically-derived rates of casualties and illnesses were adjusted to reflect differences in terrain, weather, and disease incidence for various operational theaters. Projected rates of casualty incidence were highest in Southwest Asia, followed by East Asia and Europe. Disease rate projections were similar between Southwest Asia and East Asia, with Europe disease rate forecasts approximately half of those in the Asian regions. Casualty and disease rates varied with combat/support status of troops. Projected rates showed wide variations in the daily incidence of WIA and KIA.			
14. SUBJECT TERMS Casualty projections wounded-in-action disease/nonbattle injury		U.S. Marines medical planning	15. NUMBER OF PAGES 67
16. PRICE CODE		17. SECURITY CLASSIFICATION OF REPORT Unclassified	
18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT Unlimited	