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INSTITUTE FOR DEFENSE ANALYSES

2010 Review on the Extension of the *AMedP-8(C)* Methodology to New Agents, Materials, and Conditions

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Executive Summary

In March 2010, the United States distributed *Allied Medical Publication 8 (C): NATO Planning Guide for the Estimation of CBRN Casualties, Ratification Draft 1 (AMedP-8(C))* to the North Atlantic Treaty Organization (NATO) for ratification. *AMedP-8(C)* provides a general methodology for estimating casualties resulting from chemical, biological, radiological and nuclear (CBRN) attacks against deployed military forces. In addition, the publication provides parameters and values that can be used to apply the methodology for a limited number of specified agents or effects.

This document is the second annual review by the Institute for Defense Analyses (IDA) of how information available in published literature can be used to support the development of quantifiable casualty estimation parameters for additional agents or effects. It also extends the methodology to allow consideration of conditions not included in *AMedP-8(C).*

The 2010 review focuses on efforts to meet the priorities outlined in discussions with sponsors from the U.S. Army Office of the Surgeon General and the Joint Staff. The recommendations for future work in this document are based on these priorities. Specifically, this document describes how medical countermeasures would be incorporated into Human Response Injury Profile models for agents of various types, and considers the level of effort required to do so. It also focuses on agents included or proposed for inclusion in the Common User Database (CUD), a collection of CBRN treatment protocols and estimated personnel and materiel requirements developed and maintained by the Defense Medical Standardization Board.

The review recommends that continued work should be prioritized as follows:

- First, existing human response models should be extended to include medical countermeasures.
- Second, new human response models should be developed for cholera, Ebola hemorrhagic fever, and Marburg hemorrhagic fever. Of the agents included in the CUD program of work for which human response models do not exist, these three agents are of greatest interest to the CUD sponsors.
- Third, new human response models should be developed for agents for which IDA has already conducted a preliminary review of available data and for which references have been identified. Priority should be given to those that have already been included in the CUD.
- Fourth, new human response models should be developed for the agents for which IDA has not yet identified available data and references. Priority should be given to the

broader class of agents from which one or more have already been modeled. This approach focuses effort on agents likely to be of greater interest to the broader CBRN community, and provides researchers at IDA with the opportunity to gain experience in developing models of agents with analogs among existing models. This experience will allow better exploitation of economies of scale in developing agents within the same class in the future.

- Finally, new human response models should be developed for additional agents in the CUD program of work, as that work is initiated.

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1. Introduction

A. Objective

The United States (U.S.) distributed *Allied Medical Publication 8 (C): NATO Planning Guide for the Estimation of CBRN Casualties, Ratification Draft 1 (AMedP-8(C))* to the North Atlantic Treaty Organization (NATO) for ratification in March 2010. In the draft, the parameters for implementing the *AMedP-8(C)* methodology were presented for only a limited sample of chemical, biological, radiological, and nuclear (CBRN) agents and effects. This document is the Institute for Defense Analyses' (IDA's) second annual review of the extent to which information available in published literature can be used to support the development of quantifiable casualty estimation parameters for additional agents or effects. In addition, the U.S. Army Office of the Surgeon General (OTSG) has requested that IDA begin to consider the impact of medical countermeasures on the casualty estimate, including medical treatment protocols specified in the Defense Medical Standardization Board's (DSMB's) "Common User Database" (CUD) and therapeutic and prophylactic measures currently in the advanced development process. To that end, this document includes an assessment of literature related to medical countermeasures, as well as that related to other casualty estimation parameters now incorporated in the *AMedP-8(C)* methodology.

B. Task Requirements

This document describes work done under Task Order CA-6-3079 "CBRN Casualty Estimation Update of the Medical CBRN Defense Planning and Response Project," Subtask 2 "Update Agents/Materials into *AMedP-8(C)* Methodology." It provides a "draft program of work identifying agents, effects, materials, and conditions of interest to DOD (and NATO and other Federal agencies, as requested), but not currently included in *AMedP-8(C).*" It is not an addendum to *AMedP-8(C)*, but may be considered a supplement to the *AMedP-8(C)* Technical Reference Manual for U.S. purposes. We describe our projected work estimates for the various potential components of *AMedP-8* and the basis for making those estimates.

IDA reviewed literature relevant to extending *AMedP-8* to include additional CBRN agents and effects, psychological casualties, and civilian casualty estimation. This literature review has identified tentative human response knowledge gaps, and enabled IDA researchers to make estimates of the work levels required to incorporate quantitative casualty estimation parameters for new agents into *AMedP-8*. This document is the second in a series of annual reviews, updated as the scope of *AMedP-8(C)* expands.

C. Background

AMedP-8 has evolved over the past four decades from a strictly nuclear casualty guide to one applicable to a wide range of CBRN agents. *AMedP-8* has included various casualty estimation methodologies for a wide range of nuclear weapon yields, up to three different chemical agents, and up to 11 different biological agents or organisms.

The purpose of *AMedP-8(C)* is to support the medical planning process by providing a methodology for estimating casualties that would occur uniquely as a consequence of CBRN attacks against Allied targets. The methodology provides the capability to estimate the number of casualties over time as well as the incidence of injury by type and severity. Previous versions of *AMedP-8* provided three separate chemical, biological, and nuclear documents with tabular casualty estimates for specified brigade-size units, postures, and weapons sizes or yields. *AMedP-8(C)* consolidates CBRN agents and effects into a single document and allows the estimation of personnel status within user-specified scenarios.

AMedP-8(C) describes the human response to CBRN agents and effects in terms of a Human Response Injury Profile (HRIP). The HRIP is a description of changing injury severity over time as a function of dose, dosage, or magnitude of insult. Casualty status is then defined as a function of a chosen level of injury severity. *AMedP-8(C)*, while applicable to a wider range of agents and effects than previous *AMedP-8* editions, is still limited in its application. The HRIP parameters for implementing the methodology are presented for only a subset of CBRN agents and weapon effects. These agents and effects include:

- Acute[1] effects of external whole body irradiation, including irradiation from the prompt radiation emitted by a nuclear detonation, the radiation present from the delayed radiation (fallout) resulting from a nuclear detonation, and radiation resulting from the release of seven specified radioisotopes (60_{Co}, 90_{Sr}, 131_{I}, 137_{Cs}, 192_{Ir}, 238_{Pu}, and 241_{Am});
- Acute effects of irradiation or radioactive contamination on the skin;
- Acute primary blast injuries (injuries resulting from the direct effects of the blast wave passing through the body);
- Fatalities from the dynamic pressure (wind) from a nuclear detonation;
- Acute primary thermal injuries (flash burns) from the thermal pulse from a nuclear detonation;
- Acute injuries from exposures to three chemical agents (sarin (GB), VX, and distilled mustard (HD)); and

[1] "Acute" is used to differentiate effects and injuries which produce symptoms within the first 6-8 weeks after exposure.

- Acute illness from exposure to five biological agents (anthrax, botulism, pneumonic plague, smallpox, and Venezuelan equine encephalitis (VEE)).

D. Human Response Injury Profile (HRIP) Parameters

The HRIP methodology incorporated into *AMedP-8(C)* contains a series of submodels describing specific aspects of human response. The submodels used depend on the nature of the agent or effect modeled, as described in the following text:

1. Chemical, Radiological and Nuclear (CRN) Human Response Injury Profile

The HRIP for chemical, radiological and nuclear (CRN) agents and effects is the combination of two submodels:

- Toxicity: to sort each exposure into a dose/dosage/insult range according to the ultimate severity of effects resulting for each exposure type or route of entry; and
- Injury Profile: to map the changing course of injury severity over time.

2. Biological Human Response Injury Profile

The HRIP for biological agents is the combination of five submodels:

- Infectivity: to estimate the number of individuals who will become ill, given their dose of agent;
- Incubation or Latency Period: to estimate when those individuals develop signs and symptoms;
- Duration of Illness: to estimate the length of time between onset of symptoms and death or recovery;
- Disease Profile: to describe the course of the illness or disease through clinically differentiable stages with the severity of the associated signs and symptoms over time; and
- Lethality: to estimate the number of ill individuals who die.

3. Prophylaxis

For both CRN and biological agents, the HRIP was developed in *AMedP-8(C)* without consideration of the use of any medical intervention that would change the human response to an exposure of interest. For some diseases (specifically anthrax, pneumonic plague, and smallpox) it was reasonable to expect that there would be a significantly different response due to the use of antibiotics (as chemoprophylaxis) or immunizations, and a separate set of prophylaxis parameters was developed for these agents. Therefore the availability of information on the efficacy of prophylaxis was investigated as a separate submodel of the chemical and biological

agents considered in this document. This information was collected, only for those agents with identified vaccination protocols or existing vaccination research programs and for bacterial agents that respond to antibiotics.

E. The 2009 Report and Subsequent Program of Work

The previous document in this annual series, the *2009 Report on the Extension of the AMedP-8(C) Methodology to New Agents, Materials, and Conditions* estimated the level of effort expected to develop the *AMedP-8(C)* parameters for 32 new biological agents and 12 new chemical agents, and for the psychological impact of the use of CBRN weapons. No additional radiological agents or higher order nuclear effects were addressed. In addition, the authors of the 2009 review compiled a list of 900 chemical and biological agents included on various threat lists published by various organizations within the U.S. Departments of Defense (DOD), Homeland Security (DHS), and Health and Human Services (HHS), as well as by NATO.

Since then, IDA has published the *AMedP-8(C)* parameters for five biological agents (brucellosis, glanders, Q fever, staphylococcus enterotoxin B, and tularemia). Applied Research Associates (ARA), under contract to the Defense Threat Reduction Agency (DTRA), has begun the development of similar parameters for five chemical agents (chlorine, phosgene, hydrogen cyanide, cyanogen chloride, and hydrogen sulfide).

2. The 2010 Review

A. Approach

The 2010 review is not intended to be a restatement of the 2009 report. Rather, this document considers new agents from the perspective of priorities outlined in discussions with sponsors within OTSG and the Joint Staff. The recommendations for future work in this document are based on these priorities.

Specifically, this document describes how medical countermeasures would be incorporated into HRIP models for agents of various types, and considers the level of effort required to do so. It also focuses on those agents included or proposed for inclusion in the CUD, a collection of CBRN treatment protocols and estimated personnel and materiel requirements developed and maintained by the DMSB.

B. Extension of the HRIP Methodology to Consider Medical Countermeasures

While consideration of medical countermeasures would not require significant changes to the general HRIP methodology, it would require a revision of the value of parameters associated with one or more submodels. The nature of the change and the affected submodels would depend on the type of medical countermeasure under consideration and the type of agent or effect modeled.

Prophylactic countermeasures, such as vaccines or drugs given prior to CBRN exposure, are intended to either prevent illness or injury or to mitigate its severity. For some biological agents now included in *AMedP-8(C)* (specifically anthrax, pneumonic plague, and smallpox), vaccines and antibiotics administered prophylactically are treated simply as a factor modifying the number of people expected to become ill. Should the appropriate information be available, however, consideration of prophylaxis could include alteration of the parameters of the biological infectivity submodel, such as median infective dose and the slope of the associated response curve. For CRN agents and effects, prophylaxis would alter toxicity and require a revision of the dose/dosage/insult ranges for each exposure type or route of entry.

Prophylaxis can also alter human response to CBRN agents among those who become ill or injured despite its use. For CRN agents, this would modify the profile of injury severity over time associated with specific dose/dosage/insult ranges. For biological agents, both contagious and non-contagious, consideration of these effects of prophylaxis could require changes to all submodels—incubation or latency period, duration of illness, lethality, and the profile of disease

severity over time. For contagious biological agents, this may also alter disease transmission rates if the duration of the infectious period changes.

Medical countermeasures administered as treatment are intended to improve the outcome of illness or injury among those affected by exposure to CBRN agents or effects. Consideration of treatment would affect those portions of the *AMedP-8(C)* methodology that allow estimation of human response after the onset of symptoms. For CRN agents, this would modify the profile of injury severity over time associated with specific dose/dosage/insult ranges. However, because delineation of injury severity by dose might change with the implementation of treatment, the dose/dosage/injury ranges themselves may require revision. For biological agents, consideration of treatment could change the parameter values for duration of illness, lethality, and profile of disease severity over time. For contagious biological agents, it may also alter disease transmission rates.

C. Common User Database Agents

The CUD is a work in progress, and this work continues to add treatment protocols and associated personnel and materiel requirements for various CBRN agents. Agents are included in the CUD program of work as a result of a process of nomination and prioritization from two organizations: OTSG and DTRA. Both OTSG and DTRA submitted their prioritized chemical and biological agent lists in document form:

- Office of the Surgeon General (OTSG) Guidance to Defense Medical Standardization Board (DMSB) Common User Database (CUD), handout to authors, 3 September 2009.
- Defense Threat Reduction Agency (DTRA) Guidance to Defense Medical Standardization Board (DMSB) Common User Database (CUD), handout to authors, 3 September 2009.

In combination, these two lists include a total of 56 chemical and biological agents. As shown in Table 1, the HRIP methodology has previously been implemented for 18 of these agents, which includes all 12 designated as “Priority” agents (marked with a “P” in the DTRA list column in Table 1). Human response models and associated parameter values for eight of these agents were included in *AMedP-8(C)*, five were developed by IDA as part of its 2010 program of work, and five were developed by ARA in 2010. While three of these agent models explicitly consider prophylaxis, in the form of a factor modifying the number of expected ill, consideration of medical countermeasures in the manner described above would require additional effort.

The estimate for this additional effort, as shown in the table, considers the familiarity researchers at IDA and ARA have with the relevant literature gained during the development of the existing models, together with the perceived complexity in revising the current submodels associated with different types of agents. For non-contagious biological agents, revisions would primarily involve modifying or replacing the data sets from which current submodels are

derived. Because each submodel is considered independently, this process is fairly straightforward and should average approximately one person-month for literature review, analysis and documentation. Modification of chemical agent models is more complex, because it includes the possibility that medical countermeasures would change the dose/dosage/insult ranges associated with injury severity. Because the CRN submodels are not considered independently, the estimated level of effort would include an additional two weeks for analysis and review, for a total of one and a half person-months per chemical agent. Radiological agents have very well-defined treatments that can be divided into two treatment classes: decorporation of the agent, and treatment of the radiological effects. The estimated level of effort to estimate the impact of treatment for radiological agents as a whole is one and a half person-months. Nuclear effects can be divided into four broad classes: radiation, blast, thermal, and combined effects. The estimated level of effort to estimate the impact of treatment for radiation, blast, and thermal is one and a half person-months per effect (since those treatments are well defined). The estimated level of effort to estimate the impact of treatment for combined injury is at least twice as long, three person-months, due to the complexity and unprecedented nature of the problem. Finally, considering the effects of treatment is most complex in the case of contagious biological agents. The effects of changes to existing submodels on disease transmission rates over time are subtle and would require more extensive analysis and testing of results, in a somewhat iterative fashion, in order to determine the most appropriate set of parameter values. Therefore, for contagious biological agents, the estimated level of effort for the consideration of medical countermeasures is two person-months.

Table 1. Common User Database Chemical and Biological Agents for which HRIP Models Exist

Agent Class (CBRN)	Agent Name	OTSG List to CUD	DTRA List to CUD	Comment	Level of Effort (person-months)*
Biological	Anthrax	x	P	Included in AMedP-8(C)	1
Biological	Botulinum Toxin	x	P	Included in AMedP-8(C)	1
Chemical	Distilled Mustard (HD)		P	Included in AMedP-8(C)	1.5
Biological	Plague	x	P	Included in AMedP-8(C)	2
Chemical	Sarin (GB)	x	P	Included in AMedP-8(C)	1.5
Biological	Smallpox	x	P	Included in AMedP-8(C)	2
Biological	Venezuelan Equine Encephalitis (VEE)	x	P	Included in AMedP-8(C)	1
Chemical	VX	x		Included in AMedP-8(C)	1.5
Biological	Brucellosis	x	P	Included in IDA 2010 Analyses	1
Biological	Glanders	x		Included in IDA 2010 Analyses	1
Biological	Q Fever	x	P	Included in IDA 2010 Analyses	1
Biological	Staphylococcal Enterotoxin B	x	P	Included in IDA 2010 Analyses	1
Biological	Tularemia	x	P	Included in IDA 2010 Analyses	1
Chemical	Chlorine (CL_2)	x		Included in ARA 2010 Analyses	1.5
Chemical	Cyanogen Chloride (CK)	x		Included in ARA 2010 Analyses	1.5
Chemical	Hydrogen Cyanide (AC)	x		Included in ARA 2010 Analyses	1.5
Chemical	Hydrogen Sulfide	x		Included in ARA 2010 Analyses	1.5
Chemical	Phosgene (CG)	x	P	Included in ARA 2010 Analyses	1.5

* Level of Effort is defined as the time required to add consideration of medical countermeasures—both prophylaxis and treatment—to existing models.

P – Designated as “Priority” agents on DTRA CUD List.

Of the agents for which HRIP models have not been developed, three appear on both the OTSG and DTRA lists. These agents are shown in Table 2, together with the estimated level of effort required to develop an HRIP model that includes medical countermeasures. This estimated level of effort includes estimates generated in the 2009 report for these agents, as well as estimates that include considerations of medical countermeasures. Because models for these agents have not yet been developed, researchers at IDA and ARA are assumed to be less familiar with them. Therefore, the literature review and analysis needed to consider medical countermeasures for these agents is estimated to require twice as much time as it would for those agents listed in Table 1.

- For cholera, a non-contagious biological agent, two person-months have been added to the estimate of 11 person-months provided in the 2009 report.
- For Ebola hemorrhagic fever, a contagious biological agent, four person-months have been added to the estimate of seven person-months provided in the 2009 report.
- For Marburg hemorrhagic fever, level of effort was not specifically estimated in the 2009 report. However, the 2009 report assigned Marburg to the same general agent class and organism/disease type as Ebola, and considered Ebola as the representative agent from that group when estimating level of effort. Consequently, the level of effort required to develop an HRIP model for Marburg hemorrhagic fever is assumed to be the same as that required for Ebola.

Table 2. Common User Database Agents on Both Office of the Surgeon General and Defense Threat Reduction Agency Lists

Agent Class (CBRN)	Agent Name	OTSG List to CUD	DTRA List to CUD	Level of Effort (person-months)*
Biological	Cholera	x	x	13
Biological	Ebola Hemorrhagic Fever	x	x	11
Biological	Marburg Hemorrhagic Fever	x	x	11

*Level of effort is defined as the time required to develop a HRIP model, including all required submodels and associated parameter values, both with and without consideration of medical countermeasures.

Of the remaining 35 agents, 16 appear only on the OTSG list, and 19 appear only on the DTRA list. The 2009 report provided an estimate of the level of effort required to develop human response models for 16 of these agents, as shown in Table 3. As in Table 2, the level of effort shown includes that provided in the 2009 report, plus an estimated level of effort for consideration of medical countermeasures. For non-contagious biological agents, this added effort is two-person months, for chemical agents, three person-months, and for contagious biological agents, four person-months.

Table 3. Other Common User Database Agents for which HRIP Development Effort is Estimated

Agent Class (CBRN)	Agent Name	OTSG List to CUD	DTRA List to CUD	Level of Effort (person-months)*
Biological	Crimean-Congo Hemorrhagic Fever (CCHF)		x	8
Biological	Cryptosporidiosis		x	9
Biological	Escherichia coli O157:H7 (E. Coli)		x	15
Biological	Hendra virus		x	13
Biological	Lassa Fever		x	10
Biological	Nipah virus		X	8
Biological	Psittacosis		x	15
Biological	Ricin Toxin	x		9
Biological	Rift Valley Fever		x	9
Biological	Shiga Toxin (Shigellosis)		x	12
Biological	T-2 Toxin	x		13
Biological	Tick-Borne Encephalitis		x	10
Biological	Typhus Fever		x	15
Chemical	3-Quinuclidinyl Benzilate (BZ)	x		17
Chemical	Ammonia	x		9
Chemical	Hydrogen Fluoride	x		8

*Level of effort is defined as the time required to develop a HRIP model, including all required submodels and associated parameter values, both with and without consideration of medical countermeasures.

Finally, there are 19 agents that appear on either the OTSG or DTRA lists for which the level of effort required to develop an HRIP model and associated parameter values was not included in the 2009 report. These agents are shown in Table 4. In some cases, these agents were grouped with others—as Marburg hemorrhagic fever was with Ebola, as discussed above—and hence, were represented in the level of effort calculation by a similar agent. Where that was the case, a rough level of effort is provided based on the 2009 report estimate for the representative agent in the class.

Many of the agents in Table 4 are grouped in classes where the representative agents has an existing HRIP model, developed either for *AMedP-8(C)* or in the 2010 analyses by IDA or ARA. The 2009 report did not include estimates of the level of effort for these representative cases. For these agents, it is assumed that the level of effort required to develop an HRIP model, with associated parameter values and with consideration of medical countermeasures, would be shortened due to the familiarity of the IDA and ARA researchers with the agent class and its general characteristics. For biological agents, the estimated level of effort is six person-months; for chemical agents, eight person-months.

While their presence on the OTSG and DTRA lists would indicate the contrary, some agents were excluded because they rarely appeared on multiple lists and at the time the 2009 report was written they were, therefore, considered of lower priority to most interested organizations. Due to time constraints, the preliminary literature search required to estimate the level of effort has not yet been conducted for these agents.

Table 4. Common User Database Agents for which HRIP Level of Effort is Not Identified

Agent Class (CBRN)	Agent Name	OTSG List to CUD	DTRA List to CUD	Representative Agent	Level of Effort (person-months)*
Biological	Argentine Hemorrhagic Fever [Junin virus]		x	Lassa Fever	10
Biological	Bolivian Hemorrhagic Fever [Machupo virus]		x	Lassa Fever	10
Biological	Brazilian Hemorrhagic Fever [Sabia virus]		x	Lassa Fever	10
Biological	Eastern Equine Encephalatis	x		VEE**	6
Biological	Korean Hemorrhagic Fever		x	CCHF	8
Biological	Kyasanur Forest Disease		x	Yellow Fever	13
Biological	Lymphocytic Choriomeningitis		x	N/A	
Biological	Melioidosis		x	Glanders**	6
Biological	Omsk Hemorrhagic Fever		x	Yellow Fever	13
Biological	Typhoid Fever		x	N/A	
Biological	Western Equine Encephalatis	x		VEE**	6
Chemical	Cyclosarin (GF)	x		GB**	8
Chemical	Hydrogen Chloride	x		N/A	
Chemical	Lewisite (L,L-1,L-2,L-3)	x		HD**	8
Chemical	Nitric Acid	x		N/A	
Chemical	Nitrogen Mustard (HN-1, HN-2, HN-3)	x		N/A	
Chemical	Soman (GD)	x		GB**	8
Chemical	Sulfur Dioxide	x		N/A	
Chemical	Tabun (GA)	x		GB**	8

* Level of effort is defined as the time required to develop a HRIP model, including all required submodels and associated parameter values, both with and without consideration of medical countermeasures.

**This representative agent has an existing HRIP model; developing models for these analogous agents is estimated to require six months for biological agents and eight months for chemical agents.

3. Nomination of Additional Agents

The sponsors of *AMedP-8(C)* within OTSG and the Joint Staff have stated that their 2011 priorities are to add consideration of medical countermeasures and to align *AMedP-8(C)* human response models with the treatment protocols and associated personnel and materiel requirements delineated in the CUD.

To that end, we suggest that *AMedP-8(C)* human response modeling work be prioritized as follows:

- First, existing human response models should be extended to include medical countermeasures.
- Second, new human response models should be developed for the three agents on both the OTSG and DTRA lists: cholera, Ebola hemorrhagic fever, and Marburg hemorrhagic fever.
- Third, new human response models should be developed for the agents listed in Table 3, with priority given to those that have already been included in the CUD.
- Fourth, new human response models should be developed for the agents listed in Table 4, with priority given to the broader class of agents from which one or more have already been modeled. This approach focuses effort on agents likely to be of greater interest to the broader CBRN community, and provides researchers at IDA and ARA with the opportunity to gain experience in developing models of agents with analogs among existing models. This experience will allow better exploitation of economies of scale in developing agents within the same class in the future.
- Finally, new human response models should be developed for additional agents in the CUD program of work, as that work is initiated.

Appendix A
Abbreviations

ARA	Applied Research Associates
CBRN	Chemical Biological Radiological and Nuclear
CCHF	Crimean-Congo Hemorrhagic Fever
CUD	Common User Database
DHS	Department of Homeland Security
DOD	Department of Defense
DTRA	Defense Threat Reduction Agency
HHS	Health and Human Services
HRIP	Human Response Injury Profile
IDA	Institute for Defense Analyses
NATO	North Atlantic Treaty Organization
OTSG	Office of the Surgeon General
VEE	Venezuelan equine encephalitis

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14. ABSTRACT

This is the second in a series of annual reviews on the extension of the casualty estimation methodology described in Allied Medical Publication 8 (C): NATO Planning Guide for the Estimation of CBRN Casualties in 2010 (AMedP-8(C)). While the 2009 report focused on prioritizing additional agents to be modeled, this review describes the manner in which medical countermeasures would be incorporated into AMedP-8(C) models for agents of various types and considers the level of effort required to do so. It focuses on those agents included or proposed for inclusion in the Common User Database, a collection of chemical, biological, radiological, and nuclear (CBRN) treatment protocols and estimated personnel and materiel requirements developed and maintained by the Defense Medical Standardization Board.

15. SUBJECT TERMS

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