PACER

A HOMELAND SECURITY CENTER OF EXCELLENCE

National Study Center for Preparedness and Catastrophic Event Response

Development of EMCAPS

Electronic Mass Casualty Assessment and Planning Scenarios

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EMCAPS Concept

- **Johns Hopkins Office of Critical Event Preparedness and Response (CEPAR)**
  - **Prepare the Johns Hopkins Enterprise**
  - **Connect with local, regional and national agencies**
  - **Health system preparedness in the nation**

CEPAR
Planning and Operations

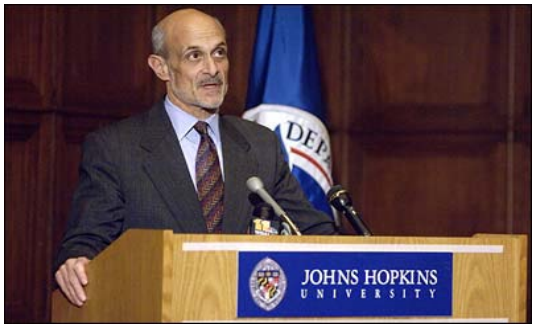
Assess Vulnerabilities

Planning

Communications

Drills and Exercises

Research



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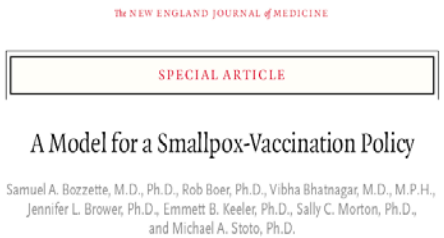


EMCAPS Development

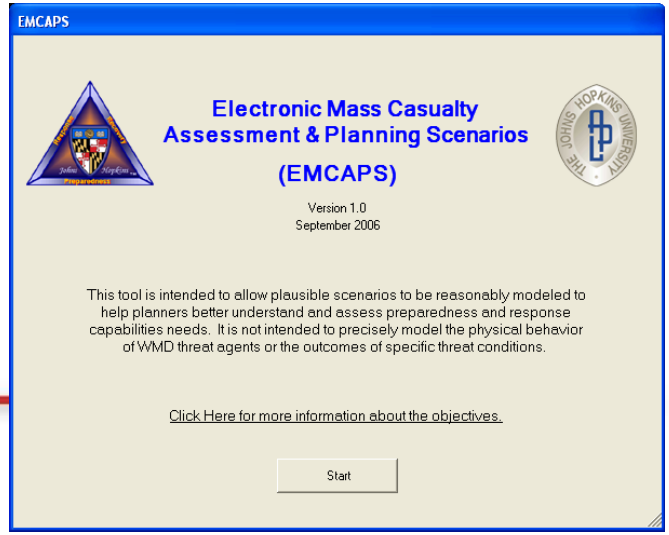
- **Development of Surge Capacity**
- **Hazard Vulnerability Analysis**
- **Capability Based Planning**
- **The Scenario: An bomb is exploded at the stadium…**
  - **Unrealistic projections**
  - **My Eyes Glaze Over effect**

EMCAPS Development

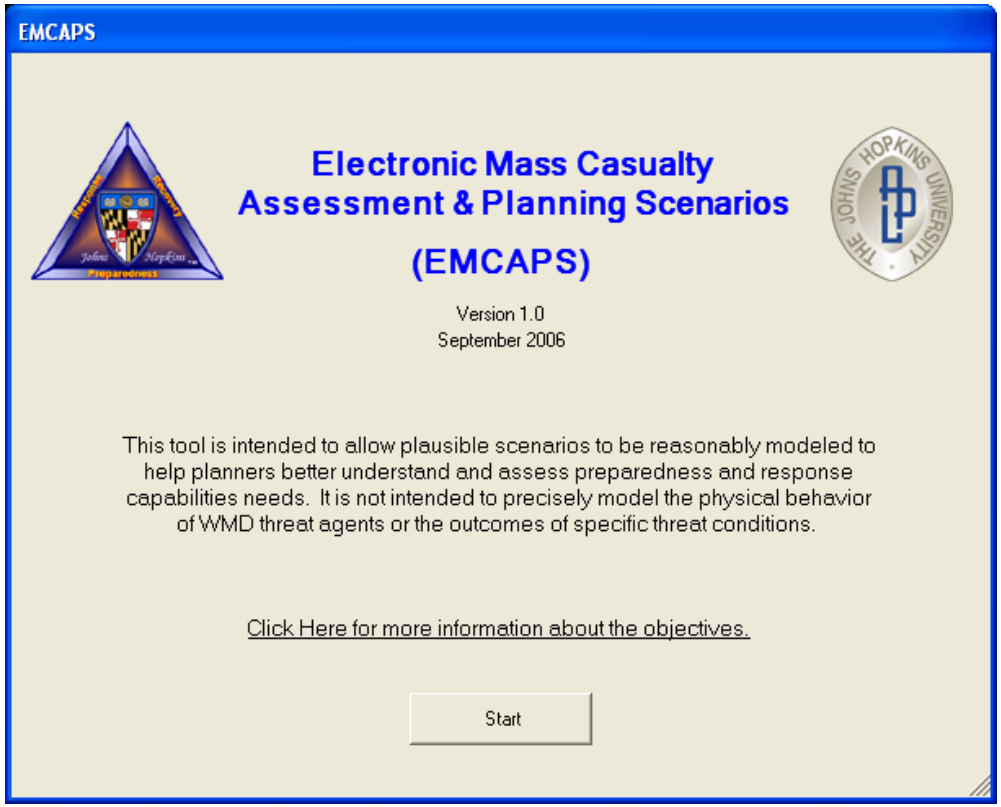
- Develop a simple planning tool
- Act as simulation or exercise front end
- Scale the National Planning Scenarios
  - Can be used for specific communities
  - Can be scaled for different events and locales
  - Useful for EMS, state and local government and healthcare preparedness personnel

EMCAPS Development

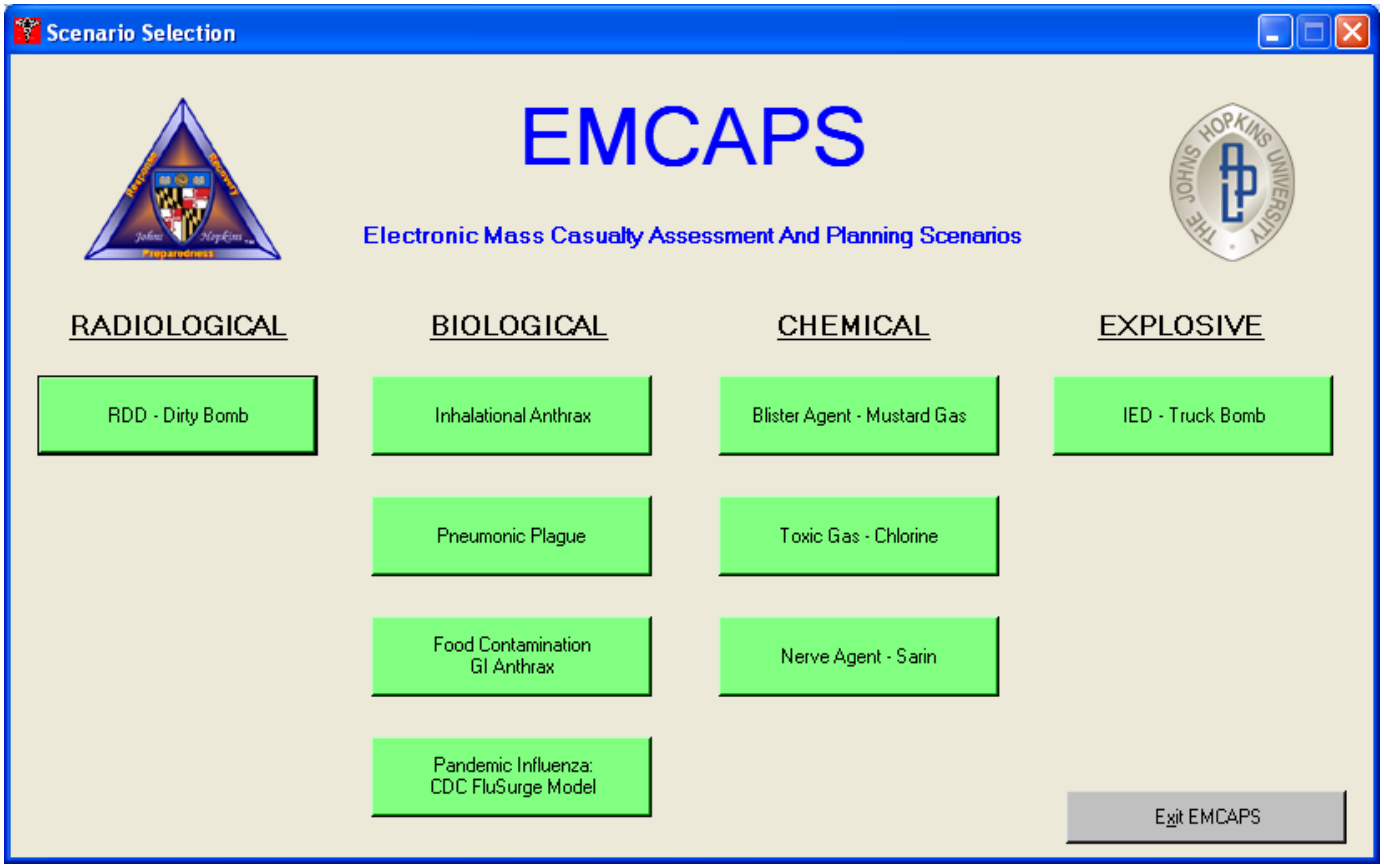
- **Assumptions and Calculations based upon DHS scenarios**
  - **Augmented by further research**
  - **Augmented by previously developed predictive models**
  - **Expert panel review of input and output variables**
    - **Weapons of mass destruction**
    - **Agent model transport and delivery**
    - **Medical management**



Electronic Mass Casualty Assessment & Planning Scenarios



Electronic Mass Casualty Assessment & Planning Scenarios



EMCAPS

- **Strong focus on EASE of OPERATION and PRACTICAL application**

Conclusion

- **EMCAPS provides a practical planning tool that enables planners at all levels to perform directed, capability based planning using scenarios that are scaled specifically for their community.**

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Electronic Mass Casualty Assessment and Planning Scenarios (EMCAPS): Development and Application of Computer Modeling to Selected National Planning Scenarios for High-Consequence Events

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Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not represent the policy or position of the Department of Homeland Security.

Few tools exist that are sufficiently robust to allow manipulation of key input variables to produce casualty estimates resulting from high-consequence events reflecting local or specific regions of concern. This article describes the design and utility of a computerized modeling simulation tool, Electronic Mass Casualty Assessment and Planning Scenarios (EMCAPS), developed to have broad application across emergency management and public health fields as part of a catastrophic events preparedness planning process. As a scalable, flexible tool, EMCAPS is intended to support emergency preparedness planning efforts at multiple levels ranging from local health systems to regional and state public health departments to Metropolitan Medical Response System jurisdictions. Designed around the subset of the National Planning Scenarios with health effects, advanced by the US Department of Homeland Security, the tool's platform is supported by the detailed descriptions and readily retrievable evidence-based assumptions of each scenario. The EMCAPS program allows the user to manipulate key scenario-based input variables that would best reflect the region or locale of interest. Inputs include population density, vulnerabilities, event size, and potency, as applicable. Using these inputs, EMCAPS generates the anticipated population-based health surge influence of the hazard scenario. Casualty estimates are stratified by injury severity/types where appropriate. Outputs are graph and table tabulations of surge estimates. The data can then be used to assess and tailor response capabilities for specific jurisdictions, organizations, and health care systems. EMCAPS may be downloaded without cost from http://www.hopkins-oepar.org/EMCAPS/EMCAPS.html as shareware. [Ann Emerg Med. 2009;53:226-232.]

0196-0644/$-see front matter

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INTRODUCTION

As part of comprehensive disaster preparedness planning, regional planners and health care system administers must routinely conduct assessments of their response capabilities, including surge capacity and overall systems resources required for accommodating the influx of casualties after an event.[1-5] Health care systems and response organizations must also assess their capability in the context of broader external factors, such as their location, populations served, and availability of outside resources. During a disaster with resultant mass casualties, all levels of responders are expected to provide the best possible care to the greatest number of victims; this can best be accomplished when a region or specific hospital medical system knows *in advance* its capability to absorb and respond to the surge.[4-6] Advance and directed planning, taking into consideration accurate scaling of a potential event and its consequent effect, allows emergency managers at all levels to act as more flexible and effective decisionmakers during the event.

To assist emergency planners, the Department of Homeland Security released a set of 15 National Planning Scenarios for use in federal, state, and local homeland security preparedness and response activities.[7] Each scenario is described in terms of background, critical assumptions, and various effects (eg, medical, financial, logistical). The scenarios are intended to be used as the basis for exercises or as planning tools to help emergency planners better understand the nature and scope of natural and terrorist-induced hazards in their area and to guide prioritization of preparedness expenditures. However, practical

Thank you!

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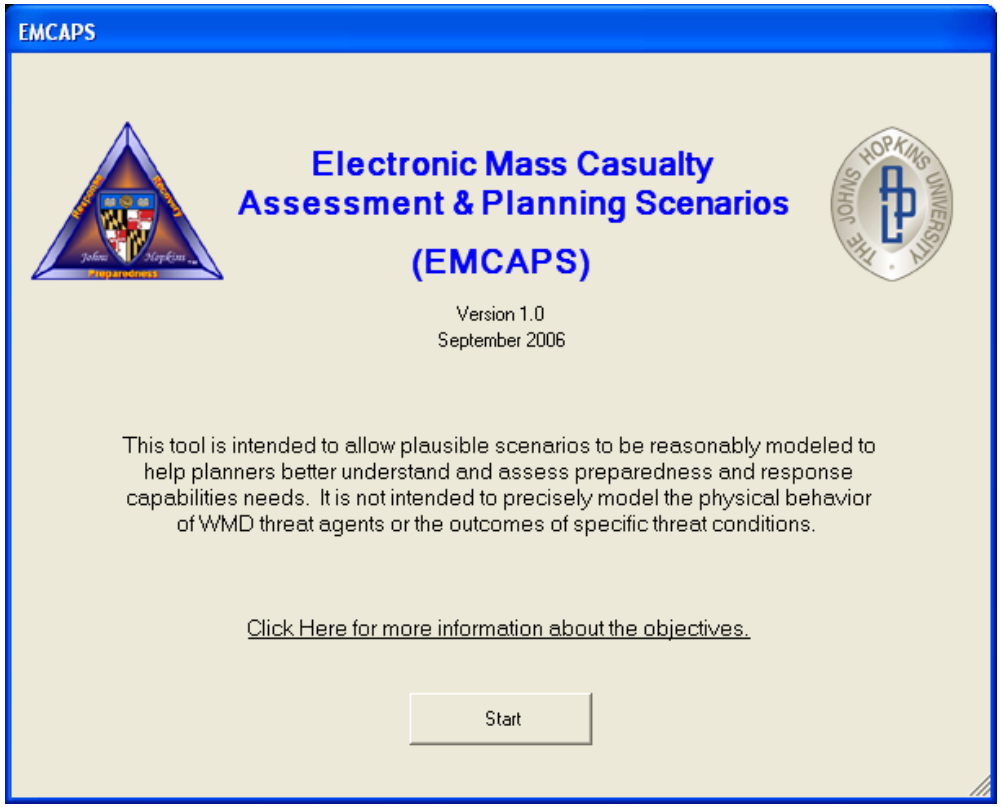
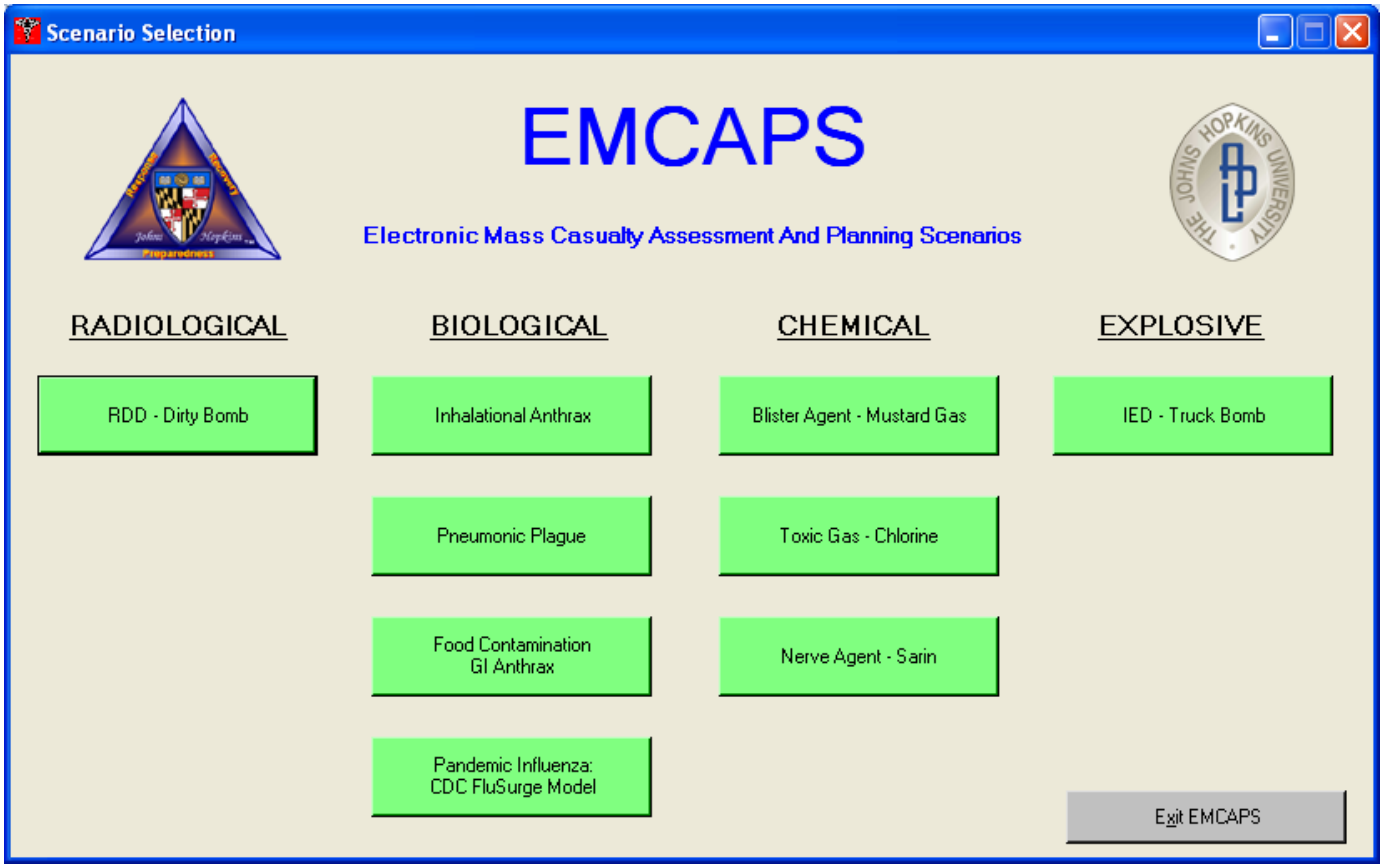
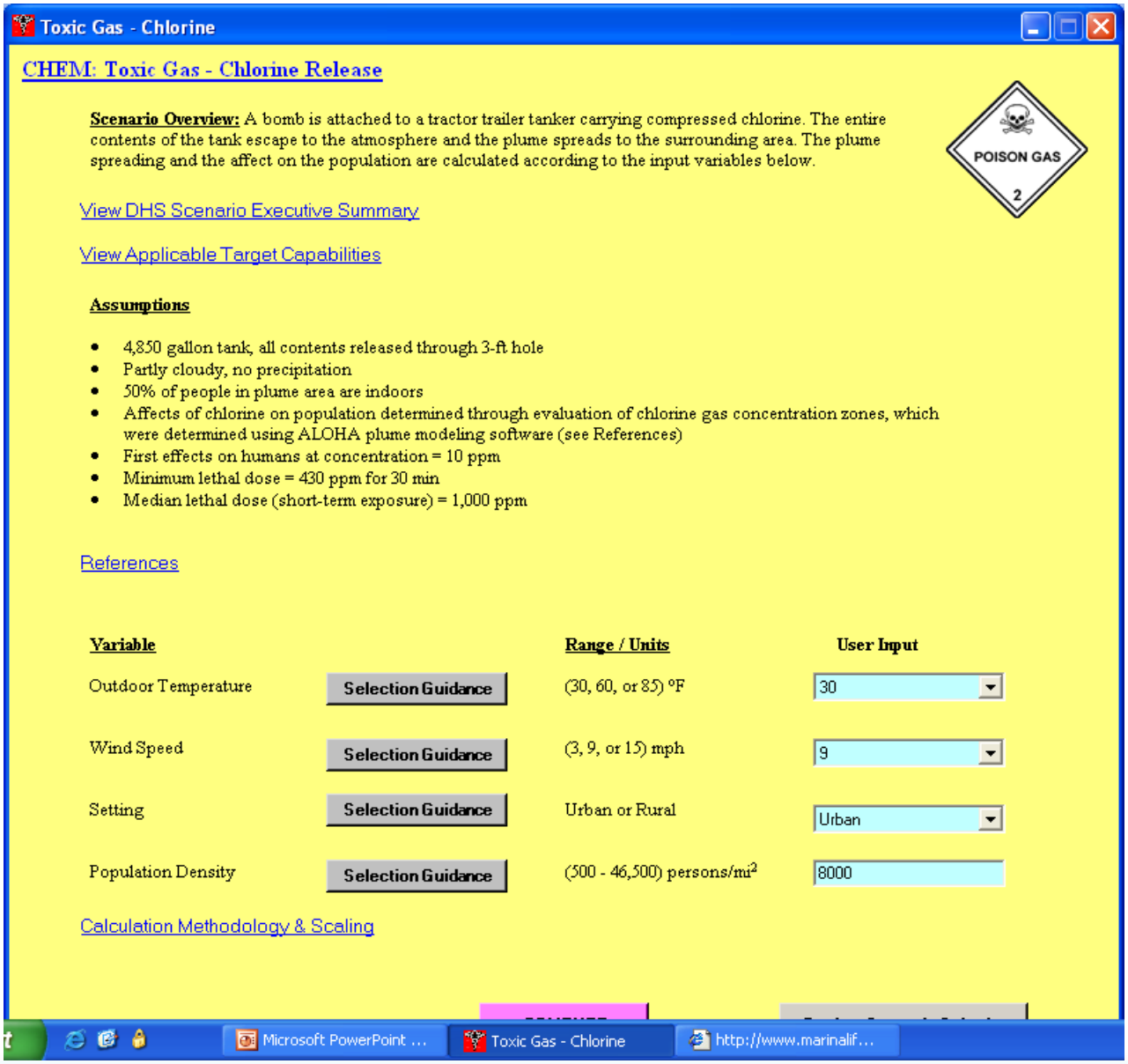
Electronic Mass Casualty Assessment & Planning Scenarios

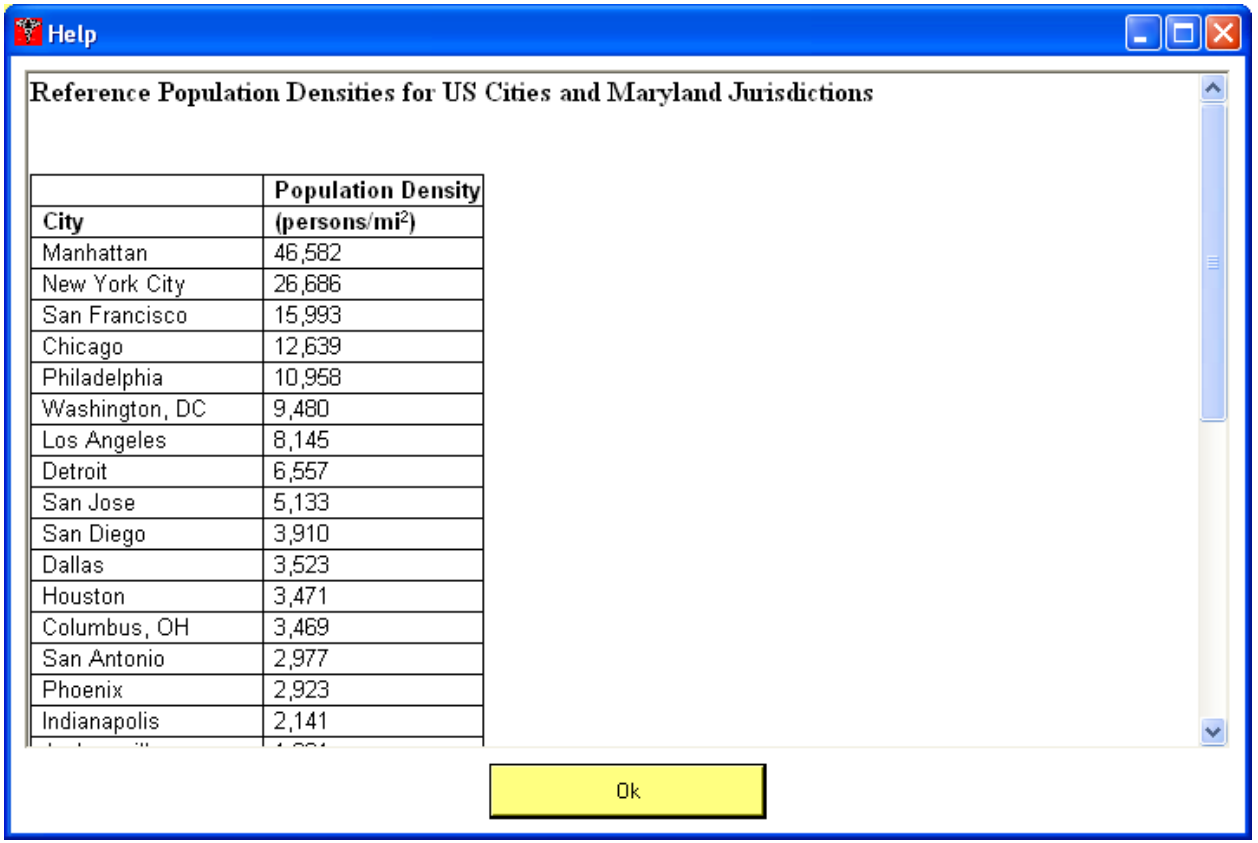


Electronic Mass Casualty Assessment & Planning Scenarios

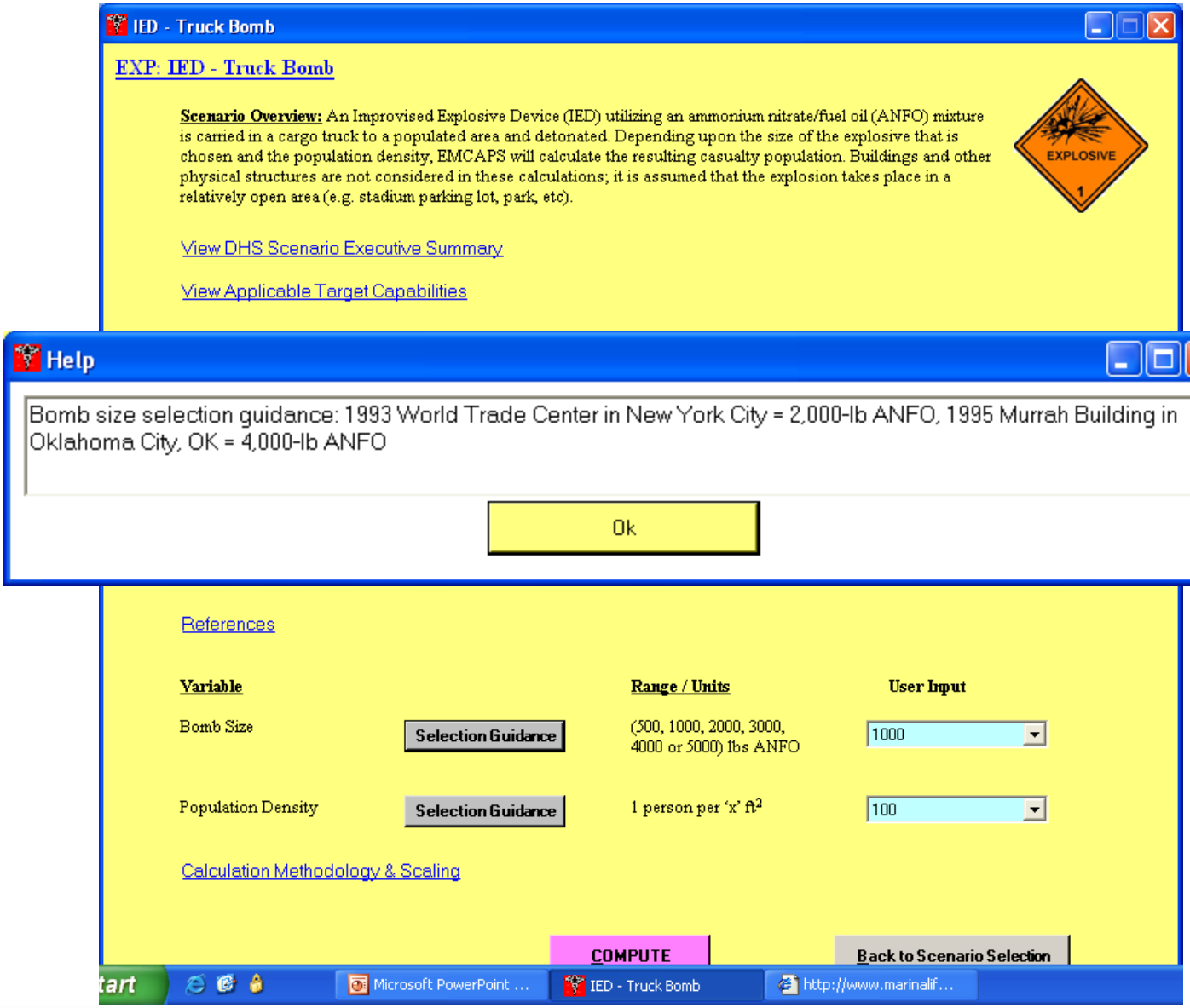


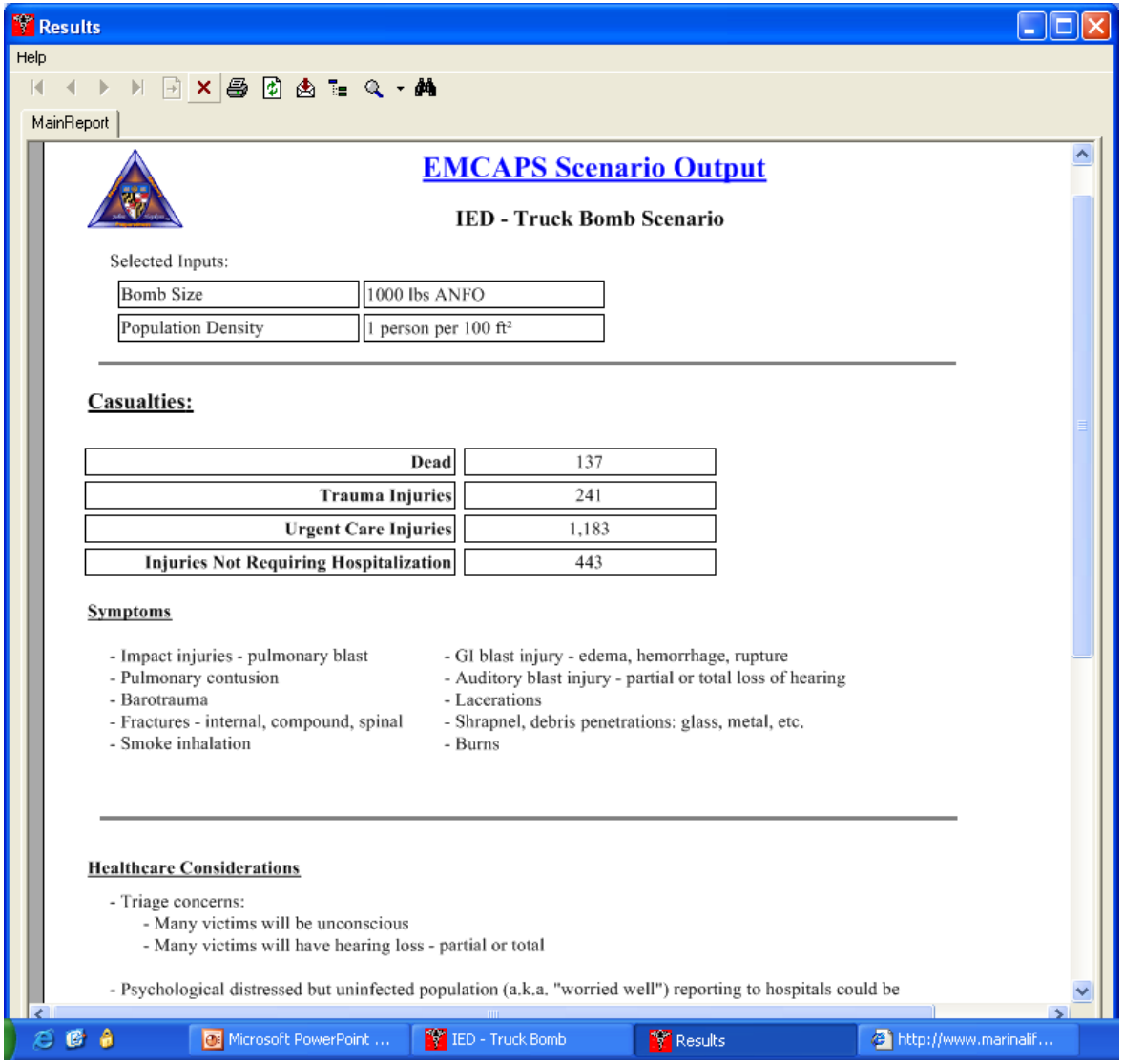

Toxic Gas - Chlorine
CHEM: Toxic Gas - Chlorine Release
Scenario Overview: A bomb is attached to a tractor trailer tanker carrying compressed chlorine. The entire contents of the tank escape to the atmosphere and the plume spreads to the surrounding area. The plume spreading and the affect on the population are calculated according to the input variables below.
POISON GAS
2
View DHS Scenario Executive Summary
View Applicable Target Capabilities
Assumptions
4,850 gallon tank, all contents released through 3-ft hole
Partly cloudy, no precipitation
50% of people in plume area are indoors
Affects of chlorine on population determined through evaluation of chlorine gas concentration zones, which were determined using ALOHA plume modeling software (see References)
First effects on humans at concentration = 10 ppm
Minimum lethal dose = 430 ppm for 30 min
Median lethal dose (short-term exposure) = 1,000 ppm
References
Variable
Range / Units
User Input
Outdoor Temperature
Selection Guidance
(30, 60, or 85) °F
30
Wind Speed
Selection Guidance
(3, 9, or 15) mph
9
Setting
Selection Guidance
Urban or Rural
Urban
Population Density
Selection Guidance
(500 - 46,500) persons/mi2
8000
Calculation Methodology & Scaling
Microsoft PowerPoint ...
Toxic Gas - Chlorine
http://www.marinalif...

Electronic Mass Casualty Assessment & Planning Scenarios



City	Population Density (persons/mi^2)
Manhattan	46,582
New York City	26,686
San Francisco	15,993
Chicago	12,639
Philadelphia	10,958
Washington, DC	9,480
Los Angeles	8,145
Detroit	6,557
San Jose	5,133
San Diego	3,910
Dallas	3,523
Houston	3,471
Columbus, OH	3,469
San Antonio	2,977
Phoenix	2,923
Indianapolis	2,141


IED - Truck Bomb
EXP: IED - Truck Bomb
Scenario Overview: An Improvised Explosive Device (IED) utilizing an ammonium nitrate/fuel oil (ANFO) mixture is carried in a cargo truck to a populated area and detonated. Depending upon the size of the explosive that is chosen and the population density, EMCAPS will calculate the resulting casualty population. Buildings and other physical structures are not considered in these calculations; it is assumed that the explosion takes place in a relatively open area (e.g. stadium parking lot, park, etc).
EXPLOSIVE
1
View DHS Scenario Executive Summary
View Applicable Target Capabilities
Help
Bomb size selection guidance: 1993 World Trade Center in New York City = 2,000-lb ANFO, 1995 Murrah Building in Oklahoma City, OK = 4,000-lb ANFO
Ok
References
Variable
Range / Units
User Input
Bomb Size
Selection Guidance
(500, 1000, 2000, 3000, 4000 or 5000) lbs ANFO
1000
Population Density
Selection Guidance
1 person per 'x' ft2
100
Calculation Methodology & Scaling
COMPUTE
Back to Scenario Selection
Microsoft PowerPoint ...
IED - Truck Bomb
http://www.marinalif...


Results
Help
MainReport
EMCAPS Scenario Output
IED - Truck Bomb Scenario
Selected Inputs:
Bomb Size
1000 lbs ANFO
Population Density
1 person per 100 ft²
Casualties:
Dead
137
Trauma Injuries
241
Urgent Care Injuries
1,183
Injuries Not Requiring Hospitalization
443
Symptoms
- Impact injuries - pulmonary blast
- Pulmonary contusion
- Barotrauma
- Fractures - internal, compound, spinal
- Smoke inhalation
- GI blast injury - edema, hemorrhage, rupture
- Auditory blast injury - partial or total loss of hearing
- Lacerations
- Shrapnel, debris penetrations: glass, metal, etc.
- Burns
Healthcare Considerations
- Triage concerns:
- Many victims will be unconscious
- Many victims will have hearing loss - partial or total
- Psychological distressed but uninfected population (a.k.a. "worried well") reporting to hospitals could be
Microsoft PowerPoint ...
IED - Truck Bomb
Results
http://www.marinalif...