

INTRODUCTION

- Increasing use of soldier-borne blast dosimeters in training
- Continuous recording of blast overpressure exposures
- Large and growing longitudinal exposure datasets
- No direct correlation: dosimeter data vs. medical outcomes
- Limits clinical usefulness and operational decision-making



Training

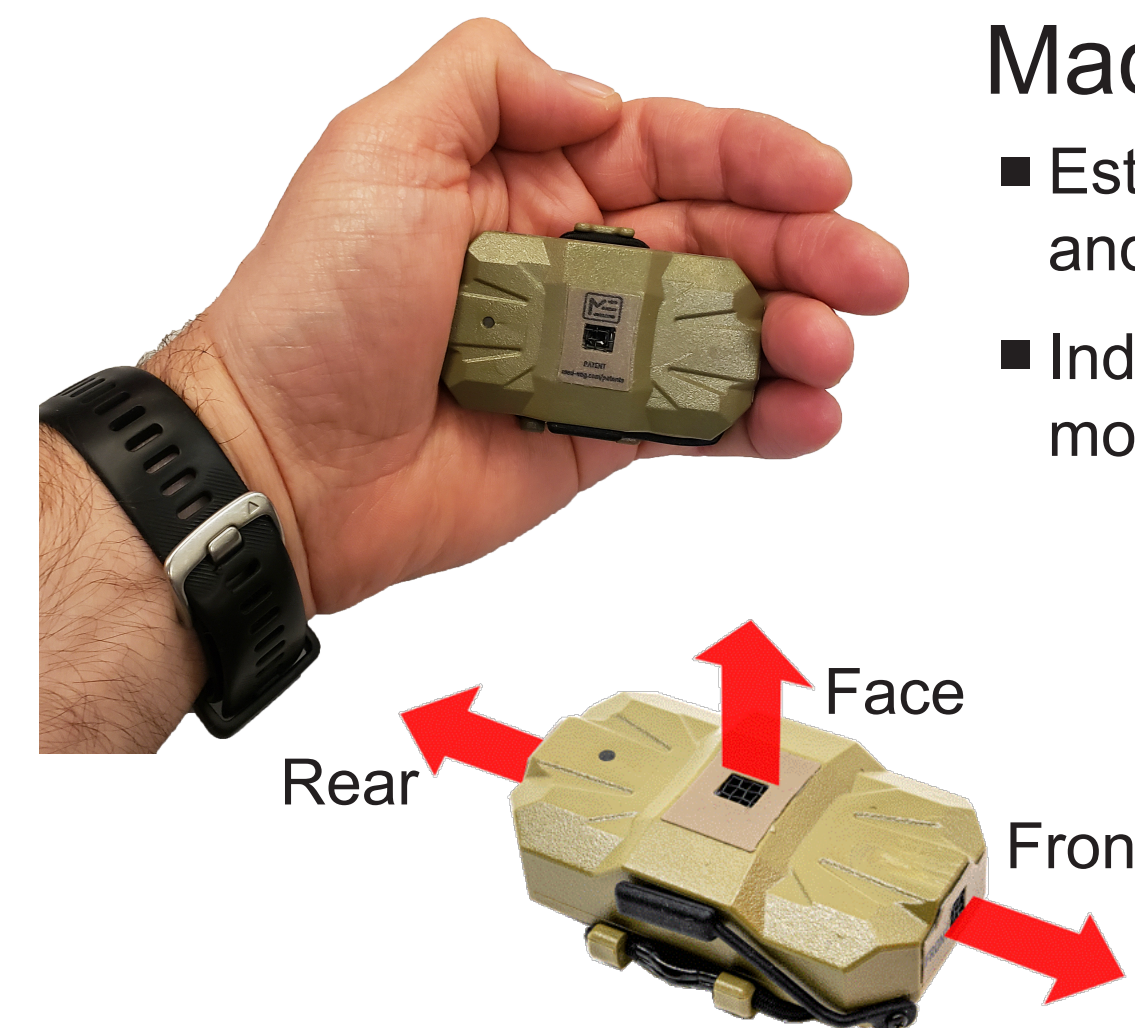


Operations

Objective

Develop a framework to link blast exposure data to medical outcomes and predict injury severity, enabling future integration of real-world datasets.

BLAST DOSIMETER



Machine Learning (ML)

- Estimated incident peak pressures and impulses estimated through ML
- Independent of sensor orientation / mounting location

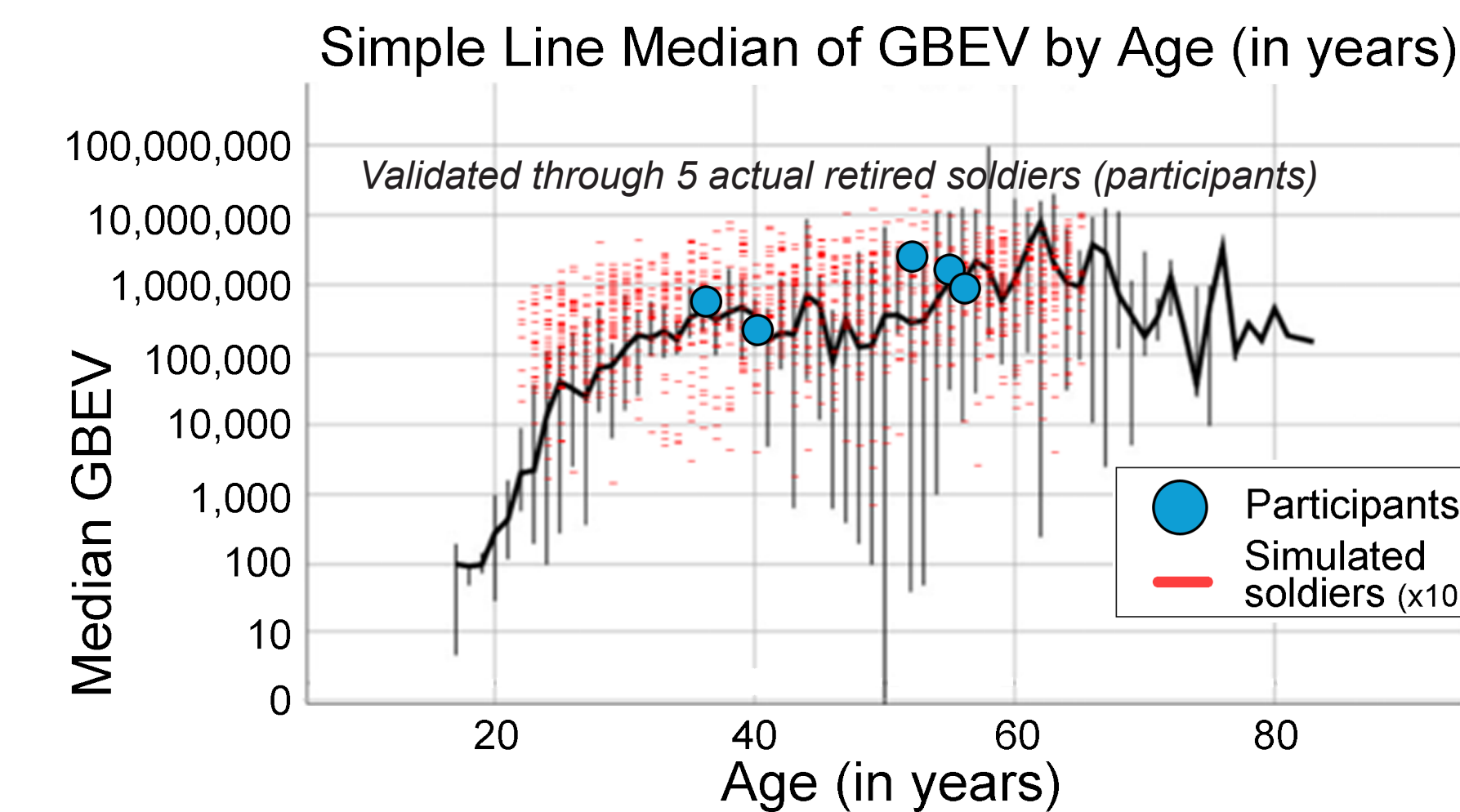


Machine Learning models validated through 1000s of blast tests vs. reference sensors

3 pressure sensors in single device (100 PSI)
Synchronous time base (100 kHz)
Event duration: 15 to 90 ms (no dead time)
Pre-trigger to ensure peak is never missed



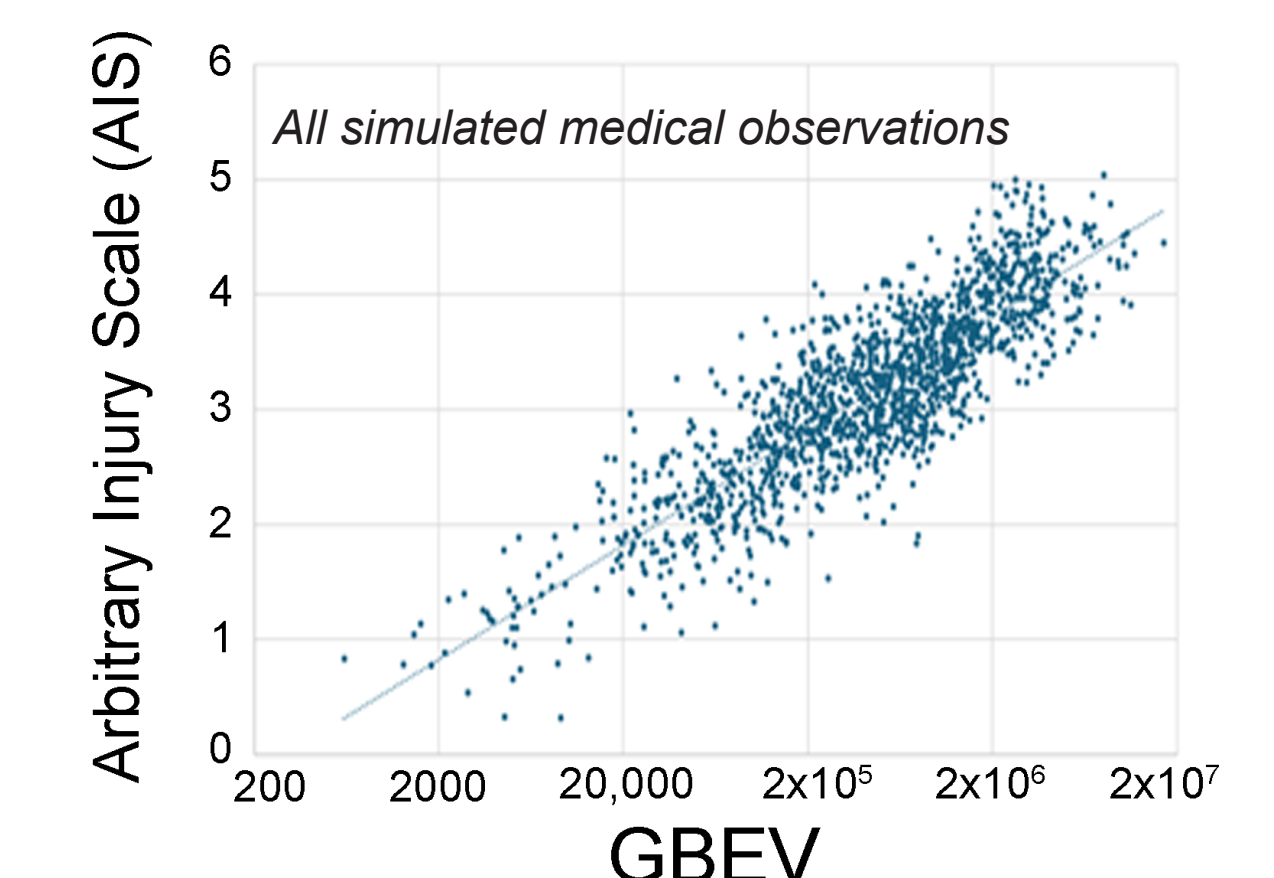
SOLDIER MODELING



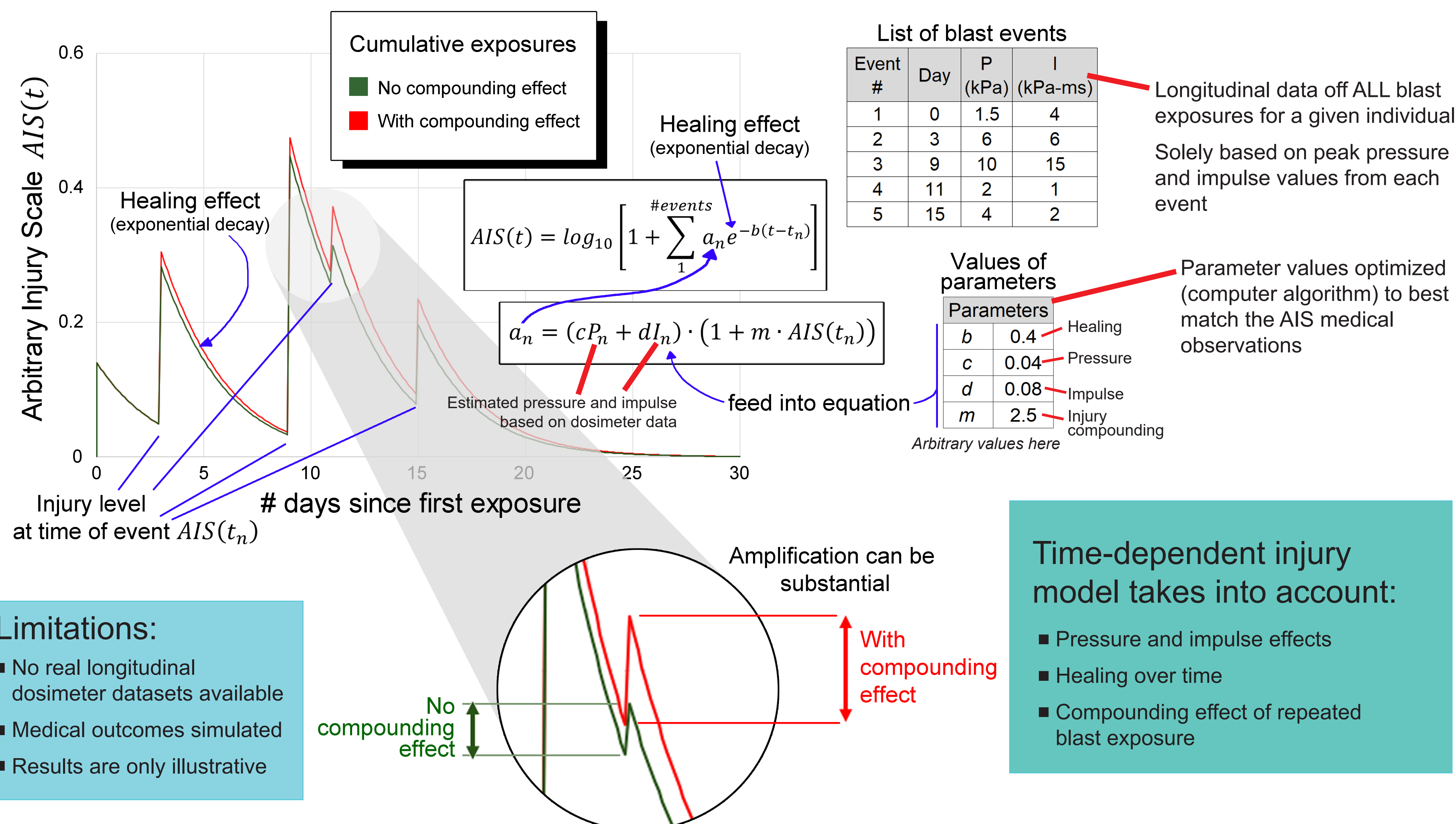
- 1000 soldier career profiles simulated
- Based on GBEV & Blast Exposure Count (BEC) covering all "CLARE" weapons types
 - CLARE 1: Small arms
 - CLARE 2: Shoulder-fired/large arms
 - CLARE 3: Artillery (e.g. mortars)
 - CLARE 4/5: Explosives (low/high) (Modica et al.)
- Randomized service duration/exposure frequency
- Generates realistic cumulative exposure ranges
- Assign real dosimeter pressure-time histories

Medical Data Simulation

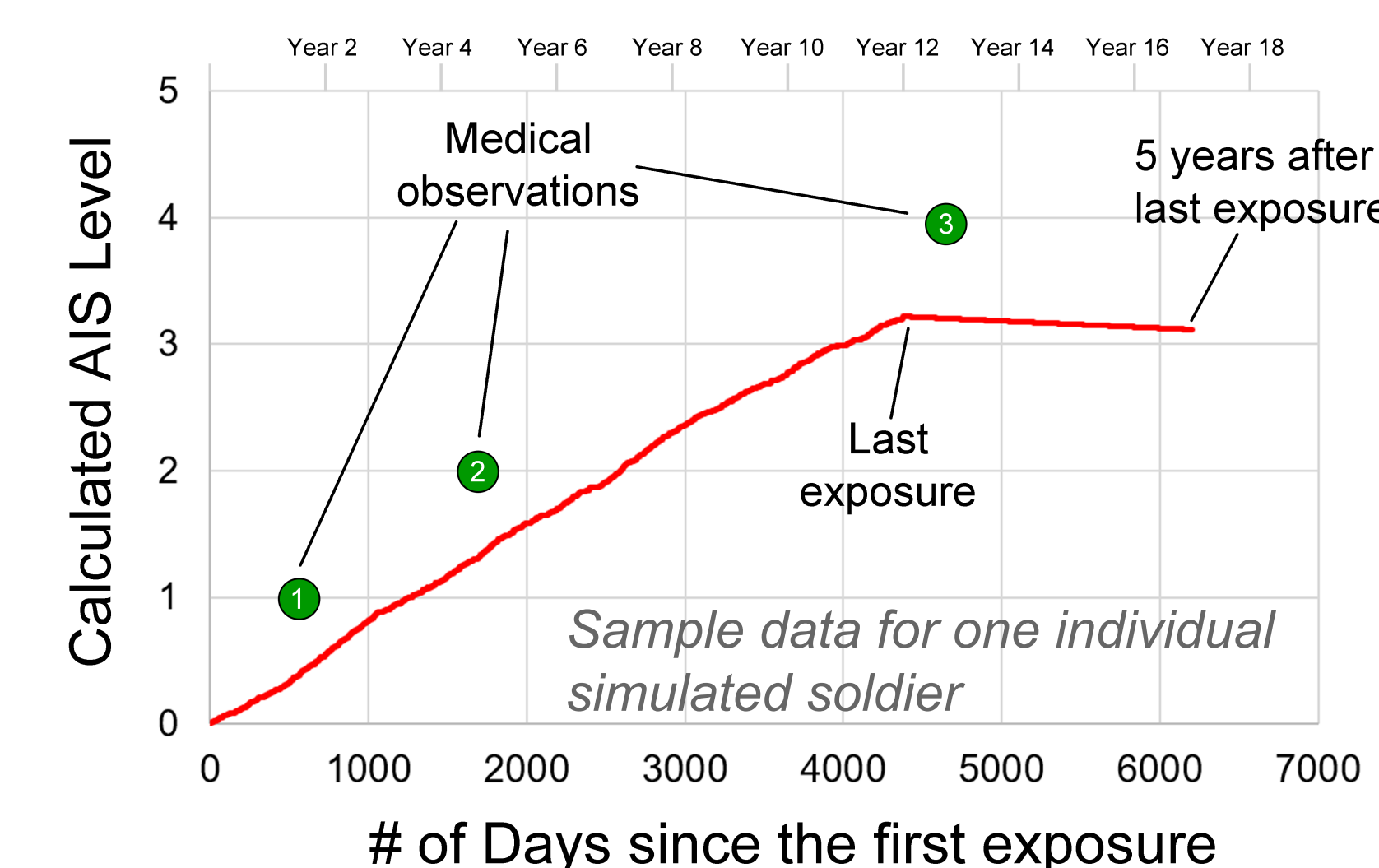
- Arbitrary Injury Scale (AIS 0 - none, to AIS 6 fatal)
- Multiple observations per career (1 to 3 typical)
- AIS levels increase with GBEV
- Randomize AIS (+/- 1) to reflect individual differences
- To be eventually replaced by actual medical observations coupled with widely accepted injury models



BLAST DOSAGE MODEL



RESULTS / CONCLUSION



- Demonstrated feasibility of exposure/injury linkage
- Scalable framework for future databases
- Continuous improvement as real dataset grows
- Key step towards preventive blast injury management

- AIS generally increases with cumulative exposure
- Post-exposure healing observed
- Model predictions typically within ± 1 AIS of observations
- Captures trends despite variability and discretization

