

Assessment of Cumulative Risks from Residential Use of Organophosphorous Pesticides

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*International Society for Exposure
Assessment*

September, 2003 Stresa, Italy

Background

- USEPA is responsible under the Food Quality and Protection Act to characterize the cumulative risks from residential, diet, and tapwater related exposures
- An assessment of the Organophosphorous pesticides (OPs) was performed in 2002 using LifeLine Version 2.0 to provide an alternative assessment using another model
- Each of the Ops is converted to equivalent amounts of an index pesticide, *Methamidophos*

Uses and Relevant Routes of Exposure

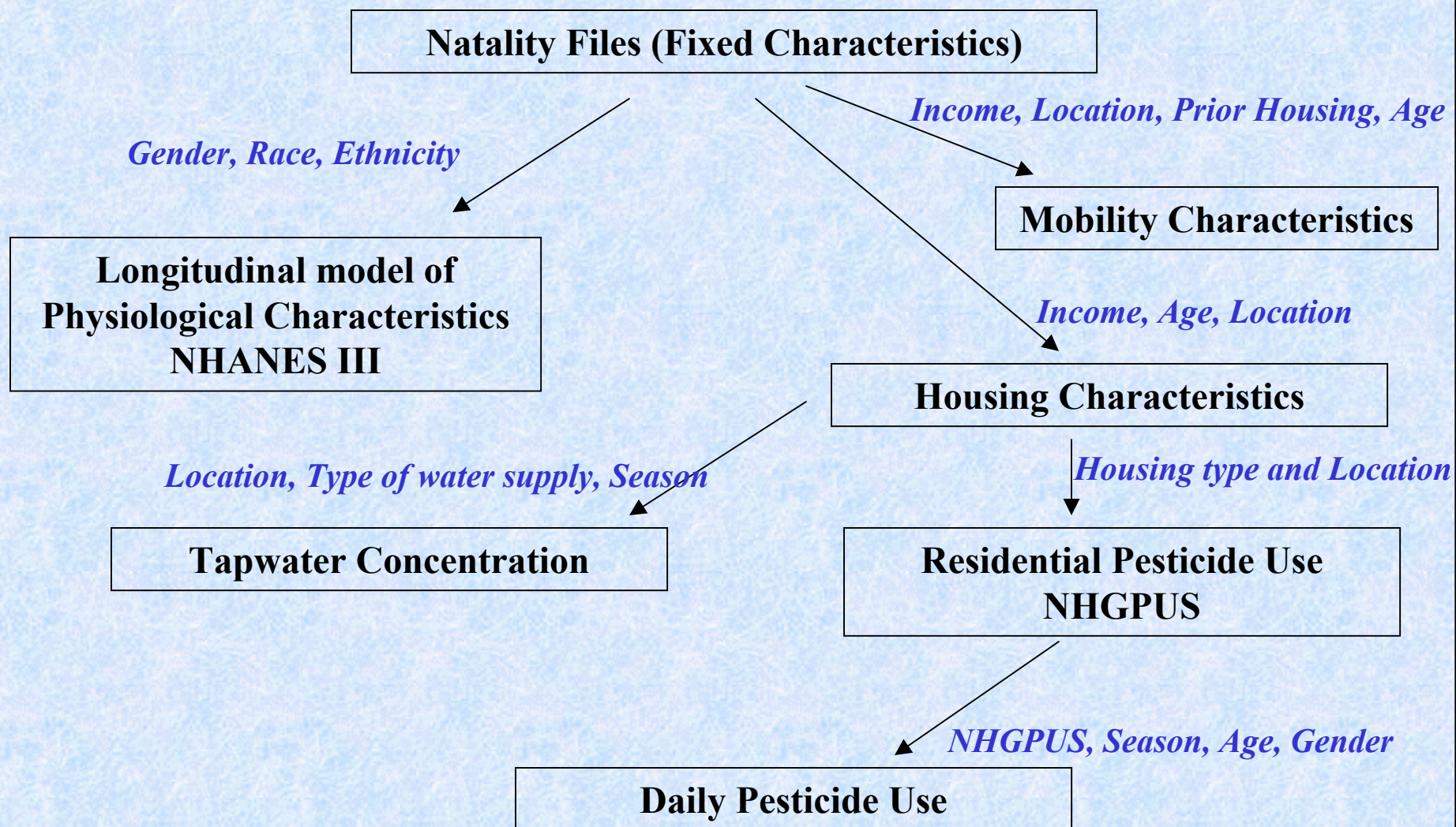
- **Pets (Dermal, Oral, Inhalation)**
 - Tetrachlorvinphos
- **Turf (Dermal, Oral, Inhalation)**
 - Bensulide and Trichlorfon
- **Gardens and Ornamentals (Dermal, Oral, Inhalation)**
 - Malathion, Acephate, Disulfoton (Dermal, Oral, Inhalation)
- **Public Health (Dermal and Oral)**
 - Fenthion, Malathion, and Naled
- **Golf Courses (Dermal)**
 - Bensulide, Fenamiphos, and Trichlorfon
- **Indoor (Inhalation)**
 - Dichlorvos

The LifeLine Approach for Simulating Individuals

- Each day's exposure is estimated based on the individual's characteristics:
 - Age of the individual
 - Location of the exposure event micro environment
 - Region and season
- Realistically link the events from one day to subsequent days
 - Residue level on one day will be related to the level on the subsequent day
- Internally consistent: the same residue concentration – used in oral and dermal pathways



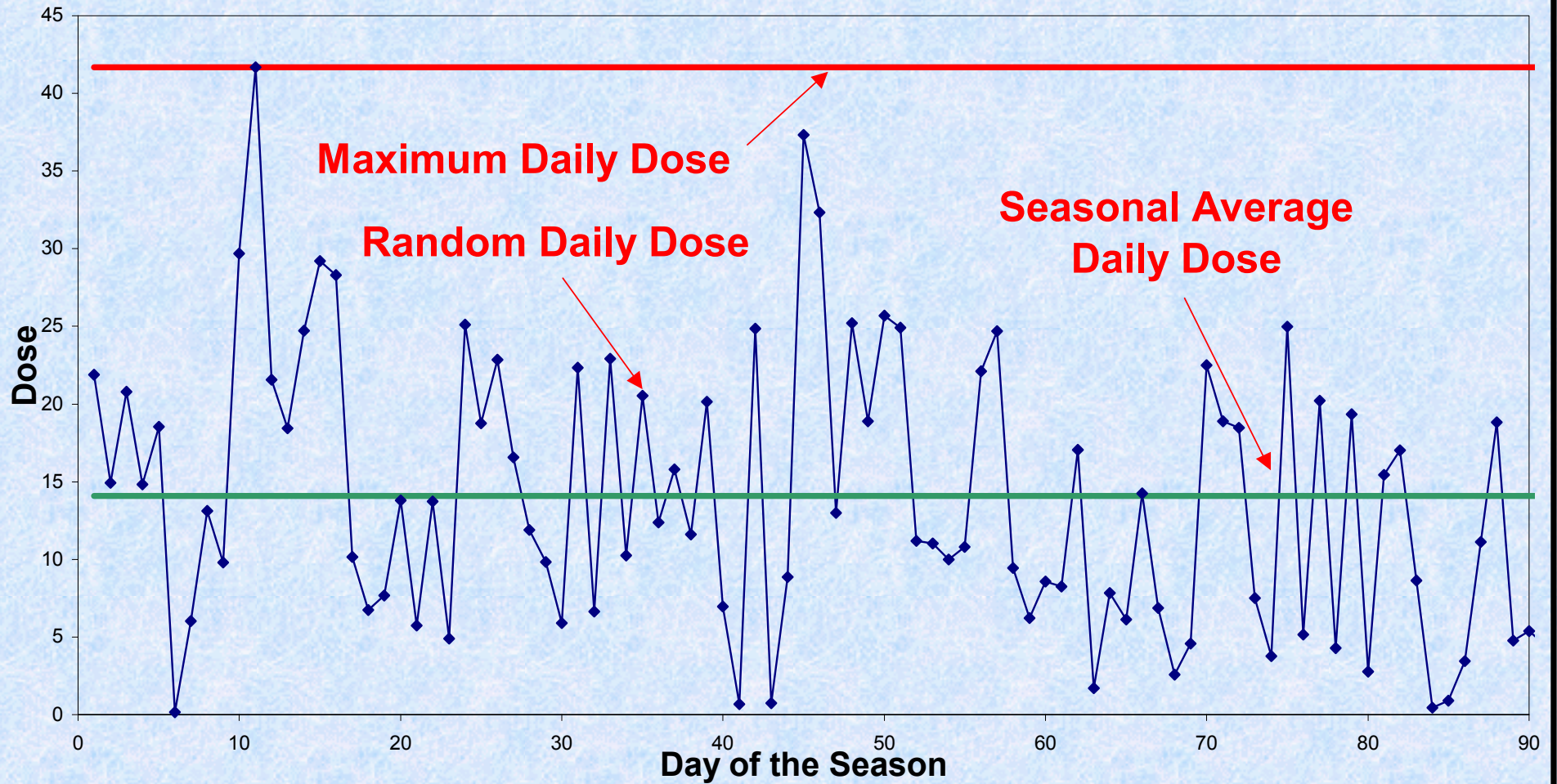
Linking Data from Multiple Surveys



Modeling Residential Exposure

- The residence is modeled as a series of microenvironments
- LifeLine determines doses from multi-route exposures in the microenvironments
 - Oral (hand to mouth), dermal, and inhalation
- Doses from all pesticides are summed to give total oral, dermal, and inhalation doses
- Separate doses are determined for each day
- Longer-term doses are determined by averaging doses from consecutive days

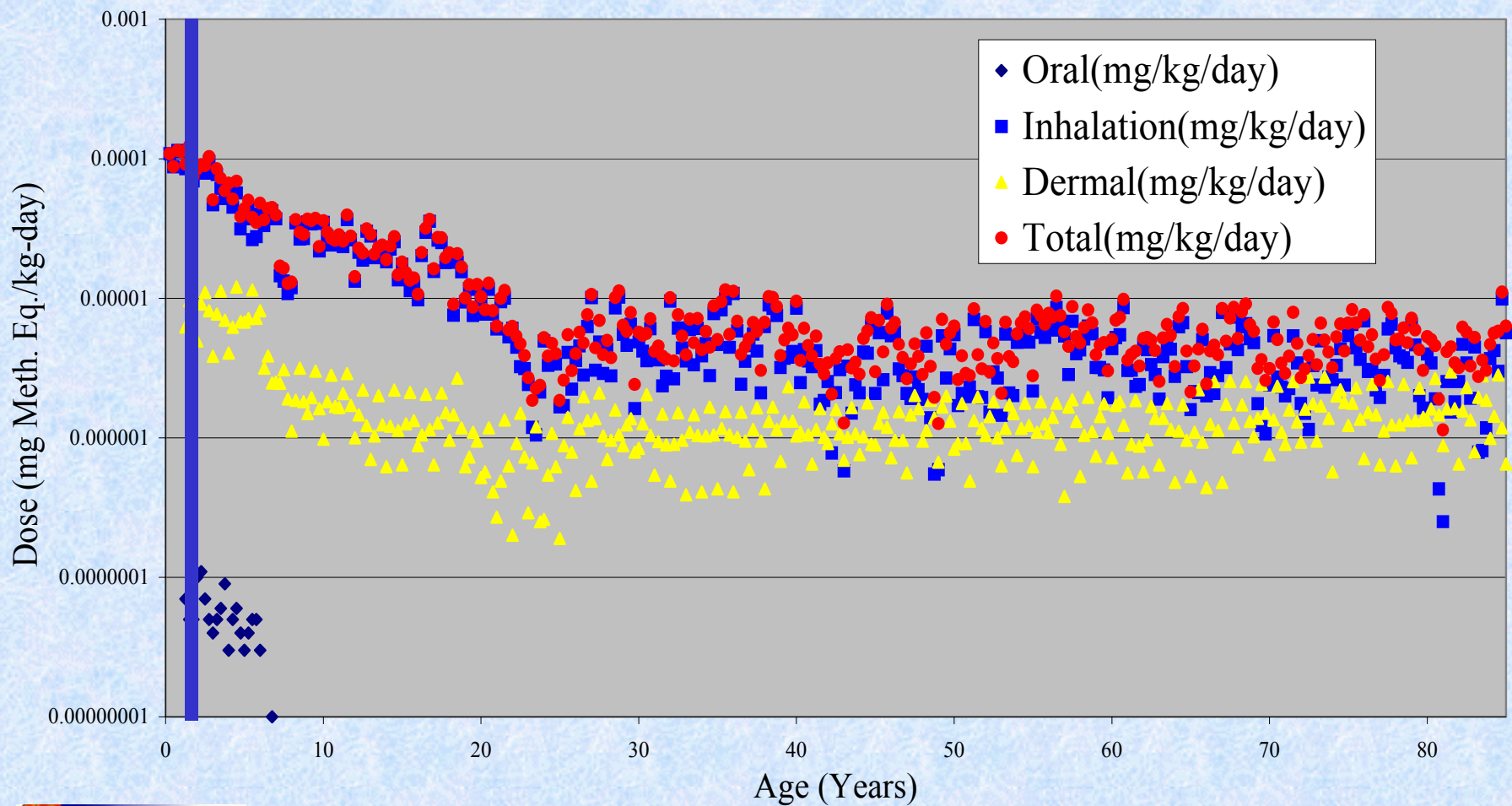
Figure 5.1 LifeLine Version 2.0 Exposure Metrics



Results

- Exposure and age
- Route-specific doses
- Risk from cumulative exposure
- Risks from specific sources

Average Seasonal Dose (Methamidophos Equivalents) By Route



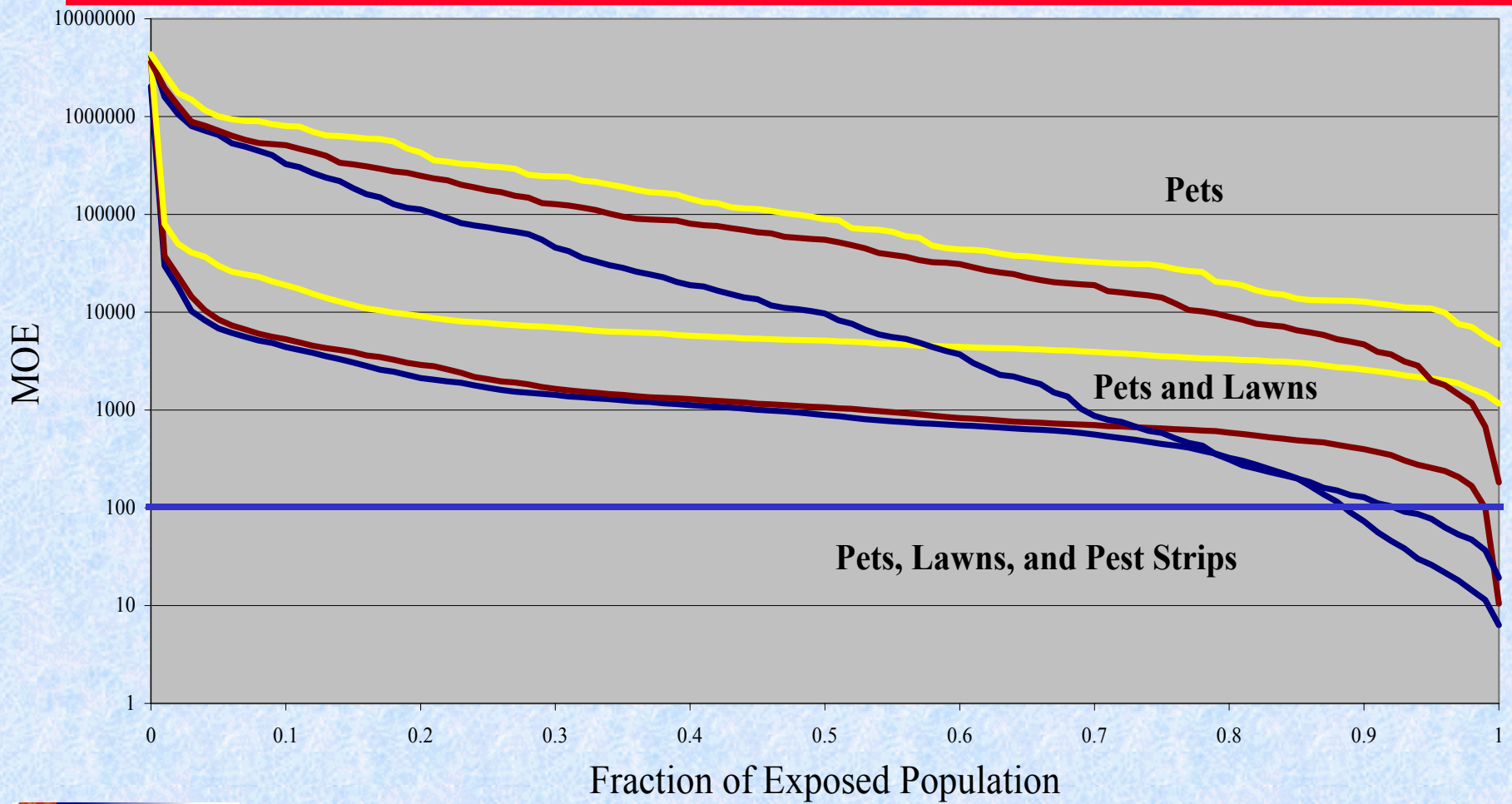
Risk Characterization

MOE based on the formula:

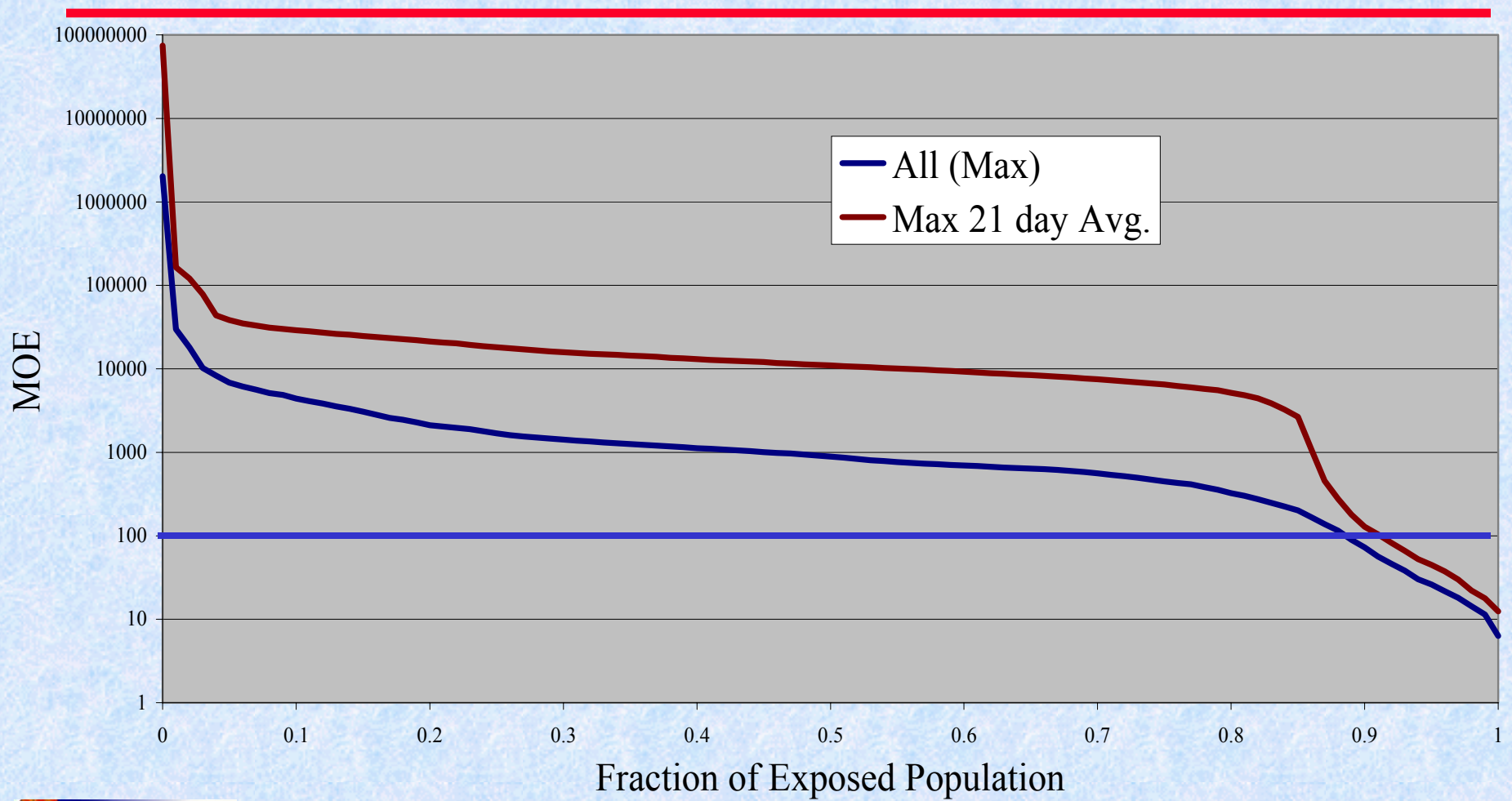
$$\text{MOE} = \frac{1}{(\text{Orl Dose}/\text{Orl POD})+(\text{Derm.Dose}/\text{Derm. POD})+(\text{Inhal.Dose}/\text{Inhal. POD})}$$

Values of MOE > 100 indicate acceptable risks

Distribution of MOEs Across Exposed Individuals (One-Day Exposures)



Impact of Increased Averaging Time on Distribution of MOEs



Summary

- Major source of risk was indoor pest strips and inhalation risks from Dichlorvos
- Other products did not result in MOE <100 for the random day but did for the maximum day
- Averaging exposure over longer periods of time resulted in significant reduction in exposures other than Dichlorvos

*Final report, input files, and
software, are available at
www.thelifelinegroup.org*



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