Societal Risk of N=1 (or more) -v- Individual Risk

Introduction

When first introduced to the concepts of Individual Risk (IR) and Societal Risk (SR), a question that often arises is 'Why is the Societal Risk of N=1 (or more) so different to the Individual Risk?'. The difference arises from the fact that IR is calculated for a specific individual (or hypothetical individual) and their pattern of exposure to the hazards. SR is calculated for a group of individuals and their patterns of exposure to the hazards as a group. SR does not distinguish between 1 individual exposed for 24 hours and 24 individuals exposed for 1 hour, but IR would do so.

Example

2 operators are present in a process control building at all times. They work 8 hour shifts, 6 days on and 2 days off. The building is hazarded by a chemical plant handling flammable materials at high temperature and pressure. The risk analysis predicts a vapour cloud explosion at a frequency of $3x10^{-5}$ per year that will cause damage to the process control building such that each occupant has a 50% chance of being killed.

IR

3x10 ⁻⁵	Х	6/8 x 8/24	X	1/2		= (3.75x10 ⁻⁶
Explosion event frequency	Cond being room explo	Conditional probability of being present in the control room at the time the explosion occurs		Conditional probability of death given that the explosion occurs and a person(s) are present in the control room		IR of fatality per year	
SR							
No of deaths	5	Base frequency	Co	nditional probability	Resu	Resulting frequency	
2		3x10 ⁻⁵		0.25		0.75x10 ⁻⁵	
1 (either operator, no	ot both)	3x10 ⁻⁵		0.5	1.5x10 ⁻⁵		

0.25

3x10⁻⁵

 0.75×10^{-5}

FN pairs

Ν	f		
2 or more	0.75x10 ⁻⁵		
1 or more	2.25x10 ⁻⁵		

0

Summary

The IR of death is 3.75×10^{-6} per year. The SR of exactly 1 death is 1.5×10^{-5} per year. The SR of 1 or more deaths is 2.25×10^{-5} per year.

Martin Goose 30th June 2010