

Fear and Perception of Risk - A Perspective on COVID-19

by Karen R. Vilas, Principal Process Safety Consultant, on behalf of BakerRisk

Introduction

The world is experiencing an international crisis the magnitude of which hasn't been seen in a generation. During the 2014 Ebola outbreak, Dr. Paul Slovic studied how novel threats provoke anxiety¹, saying "...it hit all of the hot buttons: It can be fatal, it is invisible and hard to protect against, exposure is involuntary and it's not clear that the authorities are in control of the situation." The study focused on how people perceive risk and what causes them to overreact to epidemics, terrorist attacks, and other extreme events; what Dr. Slovic's study did not include was a comparison of the risks associated with everyday life to the risk of fatality from these fear-inducing exposures. The intent of this white paper is to provide a background on everyday risks and compare them to the risk of fatality from the COVID-19 pandemic.

As a company specializing in operational hazard and risk calculation, navigating the misconception of risk is a common aspect of our work. The average person struggles with the concept of risk and risk tolerance, specifically with the idea that the potential for fatality is a part of everyday life. In processing industries worldwide, the most widely adopted individual risk tolerance criteria is defined by the United Kingdom Health and Safety Executive (UK HSE) as 10^{-3} and 10^{-4} annual probability of death (APoD) for workers and the public, respectively.² This corresponds to a 100 in 100,000 chance of fatality per year (worker) and a 10 in 100,000 chance of fatality per year (public). Understanding the concept of risk tolerance is very important during times of hardship and confusion such as with the COVID-19 pandemic.

In the sections below, risk from daily life in the United States (US) including background exposure, work exposure, and driving exposure is presented and compared to that of the COVID-19 pandemic based on currently available information.

Background Exposure

Background risk is risk that cannot be avoided (i.e., the risk of daily life). Of course, this number differs on a range of factors (e.g., gender, health and genetics, affluence, relative age, location, etc.). However, according to the National Vital Statistics System (NVSS)³, the US background risk in 2017 was 863.8 per 100,000 individuals. The data from the 2017 shows that about 50% of deaths were from heart disease, cancer, and accidents.

The 2017 NVSS report also documents the number of deaths and death rate by age group. After infancy, the probability of death increases with increasing age. The chance of fatality per year for background exposure remains under 100 fatalities per 100,000 between the ages of 1-25 until eventually rising to 13,574 fatalities per 100,000 for ages 85 and older.

¹ Lu, Stacy, *An epidemic of fear*, American Psychological Association, Volume 46 No. 3, page 46, March 2015.

² HSE, 2001: *Reducing Risks, Protecting People – HSE's Decision-Making Process*, Her Majesty's Stationery Office, London, 2001.

³ Heron, Melonie Ph.D., *Deaths: Leading Causes for 2017*, National Vital Statistics Reports, Volume 68 No. 6, 24th June 2019.

Work Exposure

Whether consciously or not, everyone undertakes a cost benefit analysis when determining whether a job's inherent risk is acceptable. A cost benefit analysis, in this instance, is an examination of what is required in terms of salary and additional benefits to offset the risk inherent in a given job. The US Department of Labor, Bureau of Labor Statistics (BLS) publishes data each year of fatal occupational injuries. The latest publication from 2018⁴ included 5,250 fatal work injuries, a 2% increase from 2017. This gives a fatality rate in 2018 of 3.5 fatalities per 100,000 full-time equivalent (FTE) employees.

Further information on death rate by job type indicates logging workers, fishing workers, aircraft pilots and flight engineers, and roofers all having fatality rates >10 times the average 2018 rate of 3.5 per 100,000 employees. Loggers lead the dangerous jobs with 98 fatalities per 100,000 FTE employees. Interestingly, this is in alignment with the processing industries risk tolerance criteria rate of 1×10^{-3} APoD per the UK HSE guidance.

Driving Exposure

According to the Texas Department of Transportation (TxDOT) 2018 Traffic Crash Facts, the fatality rate on Texas roadways was 1.29 deaths per 100 million vehicle miles travelled.⁵ TxDOT also reports that roughly 282 billion vehicle miles were traveled in Texas in 2018, which corresponds to 3,639 fatalities. In 2018, there were 17.4 million people with a driver's license in Texas, which gives a rate of 20.9 fatalities per 100,000 driver's license holders in Texas. However, assuming most of those who don't have licenses still ride in cars, with a Texas population of 28.6 million in 2018, the death rate due to vehicle crashes is 12.7 fatalities per 100,000 Texas residents.

COVID-19 Exposure

Currently, we find ourselves in a world-wide pandemic with a novel coronavirus known as COVID-19. During a period of widespread fear and mixed messaging, it is important to look at the data in the context of the other risks discussed above. As of 5th May 2020, 1,177,000 cases have been reported and 68,266 people have died from the coronavirus in the US.⁶ While we know these numbers will continue to rise over the coming months, currently 5.5% of cases have resulted in death. However, we know this number is over-inflated because widespread testing is not available; rather, only those showing symptoms or reporting to doctors/hospitals are being tested. Available data as of today suggest that most cases are mild with up to 40% of cases potentially showing no symptoms at all.

The current estimated population of the US is 328.2 million⁷; with 68,266 deaths due to COVID-19 since February 29th, the fatality rate as of 5th May is approximately 20.8 deaths per 100,000. We know the total deaths due to COVID-19 is going to increase although, thankfully, we appear to be on the downward trend for daily deaths.⁸ As of 5th May 2020, models show the total projected coronavirus deaths to be 134,475

⁴ **US Department of Labor**, *National Census of Fatal Occupational Injuries in 2018*, Bureau of Labor Statistics, News Release USDL-19-2194, 17th December 2019.

⁵ **Texas Department of Transportation (TxDOT)**, *Texas Motor Vehicle Traffic Crash Facts*, Calendar Year 2018. Online: https://ftp.dot.state.tx.us/pub/txdot-info/trf/crash_statistics/2018/01.pdf

⁶ **Fox, J. et al.**, *Coronavirus US Cases and Deaths*, The Washington Post, 21st April 2020. Online: <https://www.washingtonpost.com/graphics/2020/national/coronavirus-us-cases-deaths/>

⁷ **US Census Bureau**, *Population*, Google Public Data, 3rd April 2020. Online: https://www.google.com/publicdata/explore?ds=kf7tgg1uo9ude_&met_y=population&idim=country:US&hl=en&dl=en

⁸ **IHME**, *COVID-19 Projects: United States of America*, Institute for Health Metrics and Evaluation, 21st April 2020. Online: <https://covid19.healthdata.org/united-states-of-america>.

by August 4th. This number is reflective of current social distancing practices remaining in place until that time. This would be a fatality rate of 41 per 100,000 US residents with the implications of self-isolation and economic impacts resulting from a national shutdown through August. It is important to remember that the original estimates of fatalities ranged from 200,000 (COVID No Protection – Low) to 1.7 million people⁹ (COVID No Protection – High) without social distancing, which corresponds to fatality rates per 100,000 US residents of 60.1 and 518.0, respectively.

Relative Risk Comparison

The intent of this paper is to provide background to everyday risks and compare that to the risk of fatality in the US from the COVID-19 pandemic. This section is intended to provide that relative risk comparison without drawing any conclusions that may bias this paper, but rather solely present a comparison of facts. To that end, a selection of the risk statistics presented in this paper are summarized in Table 1 as fatalities per 100,000 individuals in order of highest risk to lowest risk. Criteria points are shown in this table for anchor points: green for the 1 in 100 years (1,000 fatalities per 100,000 individuals) “lifespan”, red for the UK HSE workplace risk criteria of 100 fatalities per 100,000 individuals, and orange for the UK HSE public risk criteria of 10 fatalities per 100,000 individuals.

Table 1. Relative Risk Comparison for Data Presented in this Paper, APoD and Fatalities per 100,000 Individuals

Item Presented in Paper	APoD	Fatalities per 100,000
Ages 85+	1.4E-01	13574
Ages 75-84	4.5E-02	4473
Ages 65-74	1.8E-02	1791
Lifespan risk, assuming 100 year life	1.0E-02	1000
Average Background Risk	8.4E-03	864
COVID No Protection - High	5.2E-03	518
Processing Industries - Workers	1.0E-03	100
Loggers FTE	9.8E-04	98
Fishers and Fishing Related FTE	7.8E-04	78
COVID No Protection - Low	6.0E-04	60
COVID Est. Economic Shutdown Projected August 4th	4.1E-04	41
Texas Auto Fatalities per Driver's License	2.1E-04	21
COVID May 5th	2.1E-04	21
Texas Auto Fatalities per Resident	1.3E-04	13
Processing Industries - Public	1.0E-04	10
Average Work Place FTE	3.5E-05	4
Work Place Transportation FTE	1.4E-05	1

⁹ Fink, Sheri, *Worst-Case Estimates for US Coronavirus Deaths*, The New York Times, 13th March 2020. Online: <https://www.nytimes.com/2020/03/13/us/coronavirus-deaths-estimate.html>

The relative risk comparison shown in Table 1 indicates that risk is dominated by increasing age (65+) as well as background lifetime risk. In fact, for the initial projections of COVID-19 deaths without social distancing and widespread shutdowns (COVID No Protection – High, the upper bound estimate), only the underlying life risks exceed the predicted APoD for COVID-19. However, the low projections for no extreme response to COVID-19 in the US (COVID No Protection – Low, the lower bound estimate) shows risks below the tolerable risk level for processing facility workplace exposure. Logging and fishing have a higher fatality rate. Both the high and low estimates for COVID-19 are less than the average background rate for a US resident.