

How Dangerous Is Scuba Diving? Let's Ask the Micromort

Is diving dangerous? This is a thorny question which has been circulating since scuba diving is no longer being perceived as an high-risk activity for macho heroes and eccentric women, and has begun to appeal to families with children. We explored the jungle of data on a quest to provide an answer as close to reality as possible.

Do we really need rankings?

From the Olympic Games to the Top 10 billboard charts, rankings are among the most successful formats in human history.. Rankings list the most liveable cities and the best rock guitarists of all time. And when a title flashes the potent keyword “dangerous”, a clickstorm inevitably follows. Unsurprisingly, the web and magazines are overflowing with rankings of the most dangerous roads, neighborhoods, and above all, animals in the world. Could it truly be that the internet left out the opportunity to list the most dangerous *outdoor activities* in the world? Of course not.

But do we really need these rankings? Ultimately, I believe we do. Certified divers seek confirmation of their perception of diving as a safe activity. Instructors want answers that help diving to compete with other activities, including competition in terms of safety. Prospective divers look for reassurance in an info-sphere that is often nebulous. Safety concerns are a prominent feature of the Zeitgeist.



How are rankings compiled?

Every human activity, including getting out of bed, is fraught with risk. Depending on the type of activity, accidents can have a variety of consequences for one's health, and the range of available statistics reflects this.

Some rankings are based on fatalities, others on visits to emergency rooms. A few take into account the severity of injuries suffered. Most rankings are based on statistics collected in the United States and tend to focus on activities popular there.

The more reliable of the data records the total accident count. Unfortunately, absolute numbers say nothing about incidence – relative frequency.

Geographical region matters as well. It goes without saying that in Europe, American Football and bull riding produce a smaller total count of visits to the emergency room than, say, riding bicycles. On the other hand (or hoof, as it were), being *chased* by bulls would make it into the European Top 20 with the contribution of Spain alone.

Then there is the question of what to measure the number of accidents against. One possible comparator would be the total number of participants. Yet this is a poor measure. It doesn't make much sense to regard those who book a Discover Diving experience once in their life and the professionals who provide that experience and dive on a daily basis as equal. A more reasonable approach to understanding how risky an activity is would be to assess its risk based on the **number of exposures**.

Consider this a trip into the number jungle, not an official ranking

In contrast to many comparable activities, there is no obligation to report dives. A diver's immersions may remain buried forever in the memory of a diving computer or logbook, without ever seeing the light of an official database. To assess how many dives are performed in total, researchers can only rely on estimates and extrapolation from known statistics. These are considered to work well, in general. In the case of diving however, even a few decimal points per million can make a difference in the ranking.



Occam's machete

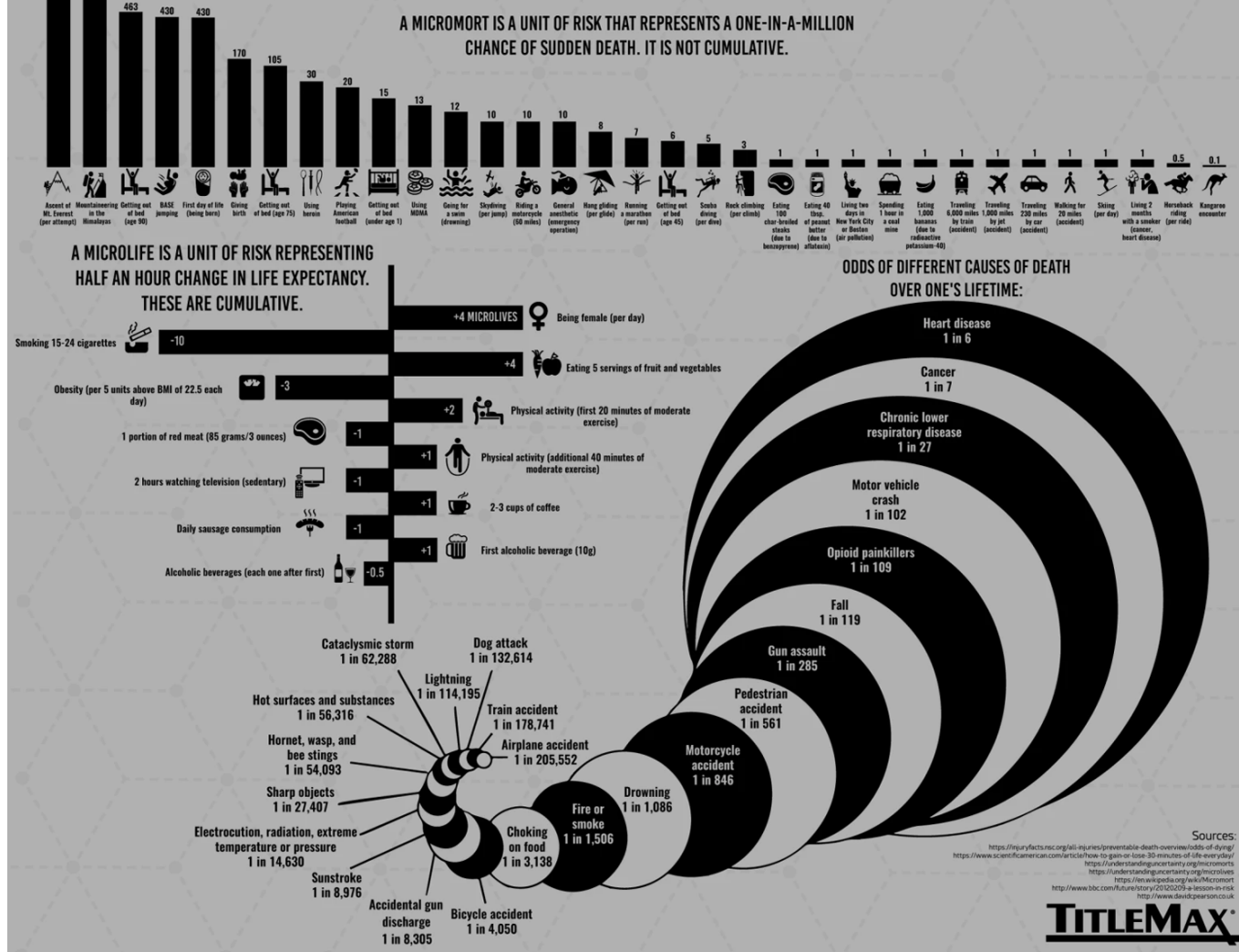
In statistics, comparing apples and oranges is the devil. We can't compare deaths to injuries, or life-time impairment to mild bruises that a person fully recovers from in a week.

The **micromort** is a unit of measurement for the incidence of a type of event that is, by its very nature, not subject to debate: death. Also, as military casualty counts would tell, death's count is a suitable starting point for evaluating the incidence of a wide spectrum of lesser mishaps. Let's begin our jungle tour with this Occam's machete in hand.

The concept of micromort was introduced in 1980 by Ronald A. Howard, a professor at Stanford University and explorer of modern decision analysis. The term micromort is a portmanteau of the words micro and mortality. It indicates a one-in-a-million chance of dying while engaged in an activity, even everyday ones. The assessment is based on available studies and statistics.

Micromort statistics can vary from country to country. They are affected by safety standards, cultural risk tolerance, and local conditions. As it is an approach and not an institution, there is no official micromort ranking. However, it is possible to compile rankings according to the concept. The following table is the one most indexed by search engines. It can be viewed [at this link](#). You will find out that a number of activities are unexpectedly rated as more dangerous than scuba diving.

How Likely You Are to Die From Different Activities and Behaviors



The rankings below are very similar, but if you compare them to the table provided by Wikipedia under the entry for micromort, you will notice some inconsistencies. It all depends on the location, time, and purpose of data collection.

Scuba diving and other activities ranked by micromort

Sticking to the micromort approach, we have tried to gather the most reliable data available. In order to provide as honest a picture as possible, we report both the lowest and highest values recorded for each activity. Here is our Top 10 according to the *highest* (worst) values:

1. Himalayan mountaineering: 12,000 to 37,000 (Everest) micromort/ascent.
2. BASE jumping: 431 micromort/jump
3. Alpinism/extreme skiing: 3 to 200 micromort/ascent or descent
4. Paragliding: 14 to 74 micromort/flight
5. Cave diving and rebreather diving: 18 to 40 micromort/dive.
6. Parachuting: 2.3 to 19 micromort/jump.

7. Recreational diving: 1.8 to 10 micromort/dive.
8. Marathon: 7 micromort/race.
9. Skiing: 0.7 micromort/day
10. Horse riding: 0.5 micromort/ride

According to the *lowest* values in the range of estimates, we got the following ranking:

1. Himalayan mountaineering
2. BASE jumping
3. Cave diving and rebreather diving
4. Paragliding
5. Marathon running
6. Mountaineering
7. Skydiving
8. Recreational diving
9. Skiing
10. Horse riding

Activities that do not compare well to diving, such as motorcycling or getting out of bed after a certain age, have been excluded. All figures reported come from reliable sources.

However, there is one question we should always ask ourselves when looking at the results of any survey: Where, how, when, by whom and for what purpose were these figures collected? How were they aggregated? Here are the answers.

The figures for **Himalayan mountaineering** are certainly reliable: Permits are required, and all attempts are recorded by local authorities. However, data collection began in the 1950s. Since then, the number of mountaineers has increased dramatically, and techniques, technologies and safety standards have changed a lot in over 70 years.

The figures for **BASE jumping** should surprise us the least: BASE, according to the definition, stands for Buildings, Antennas, Spans and Earth (cliffs). In this activity, height is a risk factor that inversely mirrors depth in diving: A shallow jump, let's say from a height of 200 metres or less, is exponentially more dangerous than a jump from 1,000 metres or more.

[The reference study on BASE jumping](#) (10 years of observation) was conducted on a single mountain, the Kjerag Massif in Norway, where the activity is legal. The Kjerag Massif is a vertical wall with a 1,100-metre drop-off. The study's objective was to assess the impact of BASE jumping on the Norwegian national health system and its tourism industry. There is no official data on the total number of jumps performed worldwide, mostly illegally, from bridges and skyscrapers.

On **mountaineering**, there are countless statistics, often accruing multiple different mountain activities: rock climbing, ice climbing, trekking, hiking on trails with guardrails, mountain biking, extreme skiing and heli-skiing. Regarding the latter two activities, a [study conducted in Canada](#), where safety standards are among the strictest in the world, reports figures ranging from 85 micromort in the 1970s to 10 micromort from 2010 onwards. Avalanches are reported as the cause of death in 84% of the cases.

Another study, conducted in Austria and Canada, considers activities ranging from hiking to climbing. It suggests an estimated number of 3 fatalities per million ascents. This calculation was based on the number of summer visitors in selected locations and the estimated percentage of mountaineers among the

visitors. The average number of ascents a mountaineer can perform during his or her stay has also been estimated and taken into account.

The [data collected at the Goûter and Tête Rousse](#) (Mont Blanc) between 1990 and 2017 are probably more reliable. They indicate one fatality per 4,952 verified visitors, or 201 fatalities per million crossings. According to this study, as many as 26% of the accidents were fatal.

Data collected in other parts of the world, from the Kilimanjaro to the Pyrenees, show similar values, even though they are also based on estimated or extrapolated numbers.

The **paragliding** figures come from two studies: One was conducted in Turkey between 2004 and 2011, where 18 fatalities were recorded from a total of 242,355 flights. Another study [conducted in the UK in 2019](#) finds an estimated mortality rate between 1.4 and 1.9 per million flights.

For the numbers on **cave and rebreather diving**, some caveats are required. Many rankings available on the web cite a study from the UK that includes accidents involving divers who ventured into caves without specific training.

It is believed, however, that these two diving activities result in [ten times more accidents](#) per exposure than recreational diving. Even when one eliminates the erroneously referenced study, the position of these activities in the ranking changes little. A recent analysis conducted by Dr Frauke Tillmans, Research Director at DAN America, presents reliable data indicating an estimated fatality rate between 1.8 and 3.8 per 100,000 rebreather dives, or 18 to 38 fatalities per million.

The most reliable data on **skydiving** comes from the US. The activity is subject to FAA (Federal Aviation Administration) regulations, and all jumps are recorded. 3.88 million jumps were performed in the United States in 2024, according to the USPA (United States Parachute Association). 9 of these were fatal, for 2.3 fatalities per million (or micromort). Worldwide, there are detailed reports from the FAI (Fédération Aéronautique Internationale), with data produced by 46 countries since 1983. The 2022 World Report records 54 fatalities out of a total of 7,888,788 jumps made, equivalent to 7 micromort. The most pessimistic historical data for parachuting dates back to 1993, with 101 fatalities out of 5,267,754 jumps made worldwide: 19 micromort.

Although the FAI admits that the information provided by some countries relies on rough estimates and not exact figures, the data is still far superior in quality compared to that on scuba diving.

Scuba diving figures are more volatile than those for aeronautical sports. As mentioned, there is no obligation to register or report dives to a supervisory body. Most dive centres keep a log, but are not required to report the data. The most extensive survey was conducted in, again, the United States, between 2006 and 2015.



According to the [data published in the study](#), in which DAN participated, some 563 deaths related to recreational diving occurred in the United States between 2006 and 2015, out of an estimated total of 306 million dives. This yields a micromort value of 1.8.

On the other side of the Atlantic, the British Sub-Aqua Club (BSAC) conducted a smaller but perhaps more accurate study. This study, published in 2007, indicated an average mortality rate of 0.54 deaths per 100,000 dives among its members, and 1.03 deaths per 100,000 dives for non-BSAC members. In those years, scuba diving and skydiving frequently swapped positions in the rankings.

It is worth remembering that **marathon running** requires an enormous amount of energy over a long period of time. The most critical variables are the physical condition of the participants and the readiness of emergency services along the circuit. The data for racing events is reliable: All participants have to register. The figures consider deaths that occurred during the race or within 24 hours of its conclusion. Deaths during training are not taken into account.

Skiing has become much less dangerous over the years, mostly due to mandatory helmets. Skiing-related injuries nowadays are mostly limited to fractured bones and torn ligaments in the lower limbs.

According to the National Safety Council, **horse riding** is the tenth most dangerous sport in the United States. Approximately 81% of riders are injured at some point in their career, and 21% suffer a serious injury. Wearing a helmet reduces the risk of mortality by 80%.

The prevalence of American statistics

The purpose of this journey is not to find an absolute number, or “truth,” but to explore relative risk. While safety standards, awareness, training levels, equipment quality, and readiness of emergency systems vary

from country to country and region to region, the United States represents a sort of benchmark. This is demonstrated in the data collected on skydiving and recreational diving, two direct “competitors” in terms of participant numbers and, yes, micromort ranking.

Risk in terms of severity of injury

Although it would be a desirable measure to have for assessing risk in its entirety, investigating the risk of diving at the level of severity of injury is a Mission Impossible. For example, statistics compiled by the National Safety Council do not even feature diving in the rankings. (Golf and barbecues are listed, however). In the United States and Canada, diving-related admissions to emergency care have a low incidence: only 1 in 10,000 of total admissions. The survivability is given as 95.3%, with 47 deaths per 1,000 ER admissions.

For mountain and aeronautical activities, typical injuries range from fractures and sprains to multiple trauma events. Every one out of three patients admitted to emergency rooms following parachuting and paragliding accidents requires at least one surgical procedure. Mountaineering accidents (Mont Blanc figures) occur at a rate of one in every 1,261 ascents. About a quarter are fatal.

We know that internal injuries, spinal and head trauma (if no helmet is worn) are particularly high among horse riding accidents, while in extreme mountaineering (above 6,000 metres), cerebral oedema, hypothermia and frostbite have a greater impact than falls.

Another possible approach to assess risk would be to compare insurance premiums by activity. Premiums could tell us about the gamble insurance companies make on potential hospital costs. Collecting this data is such a difficult task however, that even ChatGPT gave up on it. Digging into this information however raises one more question.



How do we perceive danger?

Our expedition into the data jungle is nearing its end. Let us lay fown our machetes and return to the true purpose of the micromort concept. It wasn't at all conceived to draw up clickbait rankings. Instead, its purpose is to make us aware of how misleading our subjective perception of danger can be. According to the National Safety Council – and insurance companies are well aware of this – one of the most dangerous places is the one where we feel safest: the home.

This discovery delivers two important insights. The first is that the more time we spend in a certain area, or practising any one activity, the more we are exposed to the specific risks this area or activity may hold. The second is that danger can have a habit of lurking in areas we do not secure properly, because we perceive them as safe. Areas we believe we know everything about.

While news headlines scream about accidents involving scuba divers and parachutists, there are still people in the world who attempt to quench an oil fire in a frying pan with water. The consequences of such mistakes can be far more serious than those of the average uncontrolled ascent or low-on-air situation.

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