Scuba Diving – What Are the Risks?

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Recreational diving is a very popular sport and it is frequently disclosed by people applying for Life and Disability insurance. As scuba diving is very diverse in its practice and may harbour a variety of risk factors, it can be a very challenging risk for insurance underwriters to assess. The present article aims to provide an overview on key risks associated with diving and to help the insurance underwriter discriminate between “standard” and “sub-standard” divers from a Life and Disability insurance perspective.

Scuba diving research
Despite the popularity of scuba diving, there is limited medical research on diving-related morbidity and mortality and there is no systematic data collection on how or why scuba divers die. The most reliable sources of information are annual diving incident reports published by diving associations – such as Diver’s Alert Network (DAN), Professional Association of Diving Instructors (PADI) and British Sub Aquatic Club (BSAC) – describing individual circumstances of diving fatalities that were reported to them. In these reports, worldwide data are collected from private and official sources. The latest reviews of these reports, summarising diving incidents in a period of 11 – 19 years, formed the basis of the current study on suspected risk factors associated with diving (DAN: 947 diving fatalities between 1992 and 2003; PADI: 409 diving fatalities between 1989 and 2008; BSAC: 187 fatalities between 1998 and 2009). 1,2,3

It should be noted that it is unknown how many fatalities this reporting system misses and that in almost one third of all diving fatalities, causal factors leading to death are unknown. Furthermore, “drowning” is stated as the third most common cause of death in autopsy reports – which does not provide any hint about the underlying trigger that caused the event leading to death. Therefore, “true” fatality rates and causes of death remain elusive, and the following analyses focus on published fatality rates and diving incidents in which a cause was identified.

The average diver
The average diver’s extra mortality is fairly low, ranging from 0.5 to 1.2 deaths per 100,000 dives. 4 Table 1 aims to put the diving risk into perspective by comparing it with other activities.
From these numbers, it seems that scuba diving is not a particularly dangerous sport – which is true! And this is why we can accept most scuba divers at standard rates. However, there are certain diving activities that increase a diver’s accident risk and, subsequently, mortality and morbidity, which we have defined via literature research. Those findings will be outlined in the following sections.

What makes diving risky?
There is a large diversity of factors leading to fatal diving incidents and the majority of factors are not predictable (see Figure 1). For example, we cannot predict the risk of running out of gas or the risk of rapid ascent or separation from the buddy. But there are some variables that may be predictable.

Medical problems
Studies consistently show that the main cause of diving-related death is a medical problem encountered under water. There are numerous factors that increase a person’s medical risk of a fatal diving incident: Poor fitness, chronic diseases, structural abnormalities of the heart and lungs and multiple risk factors for cardiovascular disease (obesity, diabetes, hypertension, smoking, etc.). It is important to note that stressors of exercise, pressure, cold and emotional stress are all present during a dive and increase the possibility of cardiovascular disease manifesting itself – with heart disease being the main cause of death in divers. To date, numerous diseases have been reported as contraindications for diving. We do not aim to describe the details here as it would go beyond the scope of this article. However, we would like to refer the interested reader to excellent publications available online (e.g. Eichhorn & Leyk, 2015; Smith, 1995; Godden, 2003).

In the present article, we want to alert underwriters to combine medical and non-medical assessments in people disclosing a diving pursuit. To put it simply, if a person is sick and has been assessed with significant extra mortality as per medical assessment, the death risk gets much more severe when this person dives, and we should carefully consider whether we want these risks in our insurance portfolio.

Entrapment risk
Entrapment describes the situation when a diver gets caught in fishing nets, caves, wrecks, mooring lines or under ice – and this risk is a relevant trigger of fatal diving accidents. Wreck diving and cave diving, for example, are identifiable entrapment risks.

Wreck diving
Wrecked ships and aeroplanes act as artificial reefs attracting a variety of marine life and offering archaeological and historic appeal for divers. Increasingly, ships are deliberately sunk and diver safety is improved with many of the hazards

Table 1: Average risk of death as a consequence of an activity

<table>
<thead>
<tr>
<th>Activity</th>
<th>Death per activity</th>
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<tbody>
<tr>
<td>Base jumping</td>
<td>1 in 2,314 Jumps</td>
</tr>
<tr>
<td>Kite surfing</td>
<td>1 in 16,666 Hours of practice</td>
</tr>
<tr>
<td>Diving with closed-circuit rebreather</td>
<td>1 in 18,750 Dives</td>
</tr>
<tr>
<td>Sky diving</td>
<td>1 in 101,000 Jumps</td>
</tr>
<tr>
<td>Hang gliding</td>
<td>1 in 116,000 Flights</td>
</tr>
<tr>
<td>Horse riding</td>
<td>1 in 175,418 Rides</td>
</tr>
<tr>
<td>Surgical anaesthesia</td>
<td>1 in 185,000 Operations</td>
</tr>
<tr>
<td>Scuba diving (all diving activities)</td>
<td>1 in 200,000 Dives</td>
</tr>
<tr>
<td>Rock climbing</td>
<td>1 in 320,000 Cliffs</td>
</tr>
<tr>
<td>Canoeing</td>
<td>1 in 750,000 Outings</td>
</tr>
<tr>
<td>Aircraft accident</td>
<td>1 in 125,000,000 Passenger journeys</td>
</tr>
</tbody>
</table>

Figure 1: Causal factors leading to fatal diving incidents

Source: After Cumming, Peddie & Watson, 2009, BSAC – British Sub-Aqua Club
removed. Wreck diving is usually done under controlled conditions and in guided tours and can be considered as a standard risk.

Cave diving
This sport involves the exploration of natural or artificial caves that are totally or partially filled with water and present a number of hazards. Typically, there is only a single point of entry or exit, and visibility can be low due to missing daylight or vision can be exacerbated by stirred up mud or sand. Underwater navigation through a cave system can be difficult particularly as routes are often complex and strong currents can be encountered. Cave divers are considered a high-risk group and are clearly to be rated as a sub-standard risk.

Deep diving
A study from BSAC shows that a diver’s risk of death increases the deeper a person dives. Figure 2 depicts maximum depths in which diving incidents occurred. The numbers show that 89% of all diving activities take place in 0–40 metres depth and 62% of the fatalities occur in this range. Depths below 40 metres are entered by only 11% of divers whereas 38% of diving deaths occur in these depths. Based on these numbers, the risk of dying is 3.5 times higher when diving deeper than 40 metres. Thus, there seems to be a clear bias towards the deeper depths and people who dive in great depth should be rated as a sub-standard risk.

Solo diving
It has been reported that solo diving has a ten times higher fatality rate compared to pair diving and we recommend rating solo divers as a sub-standard risk.

Rebreather diving
A rebreather is a breathing apparatus that absorbs the carbon dioxide in the diver’s exhaled breath to enable rebreathing of the unused oxygen content of each breath. Additional oxygen is added to replace the amount metabolised by the user. Before 1999, rebreathers were used only by military and professional divers but they are today widely available to recreational divers. They are increasingly popular as they enable longer, deeper dives. Rebreather divers have recently been classified as a high-risk diving group by the Diver’s Alert Network. Rebreathers have a 25-fold increased risk of component failure and fatalities have increased since 2000, accounting for about 6% of known diving deaths. A comprehensive study comparing closed-circuit rebreather diving with open-circuit
scuba diving states that rebreather divers have a fatality rate between three and seven deaths per 100,000 dives;\(^\text{18}\) this is around ten times higher than “normal” scuba diving! In view of the increasing trend in terms of popularity and fatality, we would recommend to accept rebreather divers as a sub-standard risk.

**Summary**

Divers with the smallest accidental risk are experienced divers who are physically fit, do not dive in great depth, have no history of being risk takers, do not have any health problems, do not dive with a rebreather and do not partake in any technical dives, e.g. in caves or under ice. Speaking in insurance terms, these people can be offered standard rates.

The loadings for the sub-standard risks are not specified in the present article; detailed rating suggestions based on the above outlined literature research will be provided in the next update of our underwriting manual CLUE.

**Endnotes**

4. Ibid at Note 1, 2 and 3.
9. Ibid at Note 2.
12. Ibid at Note 12 and 13.
15. Ibid at Note 2.
16. Ibid at Note 2.
18. Ibid at Note 8.