

# OBESITY AMONG DANISH SEAFARERS

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## ABSTRACT

**Background** - Danish seafarers have an excess of life style related diseases where obesity may be a factor. Obesity may in itself be a safety issue at sea.

**Objectives** – The purpose was to study overweight among male seafarers and determine the consequences if a maximum Body Mass Index (BMI) for seafarers is decided.

**Methods** - As part of the mandatory pre-employment health examination, height and weight of the seafarers are recorded and BMI calculated. From a register comprising all seafarers, basic information on each individual seafarer was obtained from the last employment period before the health examination. In this study, normal weight is defined as a BMI from 20 and up to 25, moderate overweight from 25 up to 30 and obesity from 30 and above.

**Results** – The study comprised 1,257 male seafarers. There were statistically significant more overweight seafarers in all age groups compared to a reference group ashore. Among those between 45 and 66 years of age 0.7 % had a weight below normal, 22.7 % had normal weight and 76.6 % had a weight above normal, while 30.9% of this age group was obese.

**Conclusion** - The method is applicable as a tool for an objective description of seafarers' health profile in a national and an international perspective. Overweight is found to be common and may influence the health of the seafarers and shipboard safety. Fixed BMI limits for seafarers on Danish ships would result in loss of license would have major implications even if the limit is set high.

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## **Introduction**

Danish seafarers suffer excess morbidity and mortality compared with the rest of the population of these countries although major differences exist between different groups of seafarers. The causes include life-style related diseases, accidents and suicide (1). Among the lifestyle related diseases is a high rate of cardiovascular diseases, late onset diabetes and cancers of the airways (2, 3).

It is not documented which risk factors for life-style related diseases are dominating among seafarers. Smoking is known to be widespread in the Danish seafaring community, although only limited recent data exist (4). Obesity may be another risk factor of interest.

Besides its influence on health, obesity may be a safety issue at sea. It may be difficult for obese persons to perform safety tasks aboard in emergencies, to use escape routes and ladders and to enter a lifeboat or a life raft. This can be crucial not only for the obese persons, but also for those depending on their actions or are involved in assisting them.

Furthermore, an obese person may have an excess risk of acute disease. The possibility for medical treatment at sea is reduced compared to shore based workers. This may be a serious problem to the seafarer with an acute disease but also to the ship and others who may be involved in evacuation or other activities initiated to rescue an ill seafarer at sea.

## **Purpose of the study**

The purpose of this study was to determine the magnitude of the problem of obesity among seafarers. The goal was to evaluate the need for intervention.

Besides this, the goal was to identify the proportion of seafarers who would be affected by the introduction of maximum limits of *Body Mass Index* (BMI) in the pre-employment health examinations.

## **Material and methods**

The study is based on measurements made as a part of pre-employment health examinations of seafarers who are going to sign on Danish ships. In connection with the mandatory health examination, the person's height and weight are routinely registered. The registration is used for calculation of the person's Body Mass Index ( $BMI = \text{weight (kg)} / \text{height}^2 \text{ (m)}$ ). Afterwards, the records are forwarded to the Danish Maritime Authority (DMA).

An employment contract is filled out in connection with engagement on board a Danish flagged ship. A copy of the employment contract is forwarded to the DMA and the data is recorded in a database.

By merging the two datasets, basic information on each individual seafarer was obtained. The seafarers were classified according to their rank on the most recent employment period before the health examination. The examination data comes from the years 2001 and 2002. A consecutive sample of seafarers was taken from both years.

The results from this study have been compared with data from a large health study made by the National Institute of Public Health (5). The reference data are based on self-reported data and not on objective measurements like the present study.

The study only included Nordic male seafarers (Denmark, Sweden, Norway, Faeroe Islands, Finland and Iceland) due to the assumption that this would give a correct image of a group of seafarers living under comparable conditions with regard to lifestyle. The majority (95.7 %) are Danish seafarers. BMI was used as an indicator for obesity:

BMI < 20.0 : Below normal weight  
 20.0 <= BMI < 25.0: Normal weight  
 25.0 <= BMI < 30.0: Moderate overweight  
 BMI >= 30.0: Obesity

The inclusion criteria were: Nordic male citizens who were registered as seafarers at the time of the health examination. Hence, persons not found in the register of seafarers before the date of the health examination were excluded. To compare with non-seafarer data from the National Institute of Public Health (5), a similar division in age groups was done: 16-24 years, 25-44 years and 45-66 years.

### Data

A total of 1,257 seafarers were included from 3,050 consecutive health examinations (491 from 2001 + 2,559 from 2002). Exclusions were done for the following reasons: 614 had no previous recorded engagement on Danish merchant ships (mainly fishermen), 403 were employed for the first time after the examination, 398 were not from one of the Nordic countries, 200 were women, 157 had no height/weight records, 13 were older than 66 years and 8 forms had errors.

Table 1 shows the distribution of the included seafarers according to the type of vessel on which the individual seafarer was employed prior to the health examination.

Type of vessel	Number (%) of seafarers
Container vessel	217 (17.2)
Roll on/Roll off vessels including passenger vessels	424 (33.7)
Tank and bulk vessels	192 (15.3)
Coasters	149 (11.9)
Other	275 (21.9)
Total	1,257 (100.0)

Table 1: Number (%) of included seafarers according to the type of vessel on which the individual seafarer was employed prior to the health examination.

## Results

In Table 2, the number of seafarers and in each BMI group is presented, divided in officers, ratings and totals. Table 3 shows the number and percentage of all seafarers with BMI above 35.0 according to age and BMI intervals of 5.

BMI / Age	16-24 years			25-44 years			45-66 years		
	Ratings (%)	Officers (%)	Total	Ratings (%)	Officers (%)	Total	Ratings (%)	Officers (%)	Total
<b>BMI &lt; 20.0</b>	9 (9.1)	0 (0.0)	9 (8.5)	11 (3.9)	6 (1.8)	17 (2.8)	1 (0.5)	3 (0.9)	4 (0.7)
<b>20.0 ≤ BMI &lt; 25.0</b>	50 (50.5)	5 (71.4)	55 (51.9)	123 (43.9)	122 (36.6)	245 (40.0)	44 (21.2)	78 (23.6)	122 (22.7)
<b>25.0 ≤ BMI &lt; 30.0</b>	31 (31.3)	2 (28.6)	33 (31.1)	100 (35.7)	138 (41.5)	238 (38.8)	95 (45.6)	151 (45.8)	246 (45.7)
<b>BMI ≥ 30.0</b>	9 (9.1)	0 (0.0)	9 (8.5)	46 (16.5)	67 (20.1)	113 (18.4)	68 (32.7)	98 (29.7)	166 (30.9)
<b>Total number of persons</b>	99 (100)	7 (100)	106 (100)	280 (100)	333 (100)	613 (100)	208 (100)	330 (100)	538 (100)

Table 2: Distribution of all seafarers according to rank, ratings (non officers) versus officers by age and BMI. The percentages refer to the percentage of total number of persons in the rank and age group in question.

BMI / Age	Number of seafarers (%)			
	16-24 years	25-44 years	45-66 years	Total
<b>BMI &gt; 35.0</b>	4 (3.8)	27 (4.4)	49 (9.1)	80 (6.4)
<b>BMI &gt; 40.0</b>	1 (0.9)	8 (1.3)	9 (1.7)	18 (1.4)
<b>BMI &gt; 45.0</b>	0 (0.0)	1 (0.2)	3 (0.6)	4 (0.3)

Table 3: Distribution of all seafarers with BMI above 35.0 according to age and BMI intervals of 5.

## Discussion

This study is based on a large random sample of seafarers having a pre-employment health examination done. It is likely to be representative of Nordic seafarers aboard Danish ships. The results show that a large proportion is overweight. When comparing our study with data from The National Institute of Public Health in Denmark (6,064 male Danes between 16 and 66 years) (5), a higher percentage of the seafarers in all three age groups were overweight. In the age group 16-24 years, 39.6% of the seafarers had a BMI on 25 or above versus 22.5% among the general population (relative risk (RR) 1.76 (1.36-2.28)). For the age group 25-44 the corresponding figures are 57.3% versus 45.4% (RR 1.26 (1.16-1.37)) and for the age group 45-66 years the percentages are 76.6% versus 48% (RR 1.57 (1.48-1.67)). The difference between Nordic seafarers and male Danes was even more apparent among the obese with BMI at 30 or above: 9% versus 5% the 16-24 year group, 18% versus 7.3% in the 25-44 year group, and 31% versus 13% in the 45-66 year group. However, the two studies should be compared with some caution, as the Public Health study had a different age distribution with relatively more men in the youngest group and less in the two older groups and it also included men outside the workforce. Furthermore, it was based on self-reported information on weight and height. Self-reported data on height and weight tend to underestimate the true Body Mass Index (6), and thus the observed differences between seafarers and the general population may be overestimated.

Obesity may cause serious health problems (7), and at sea it may also be of importance to the safety of the seafarer himself as well as the safety of the ship. Proper documentation regarding this problem is sparse, but there is anecdotal data like the following example: During a vertical chute

evacuation drill in 2002 on a ro-ro ferry, a fatal accident occurred and was investigated by the Marine Accident Investigation Branch (MAIB) (8). The deceased person was a female, 53 years old, 1.68m height and weighed about 100 kg. (BMI = 35.4). The most likely cause of death was reported to be positional asphyxia, but obesity may be a likely contributing cause, even though it is not mentioned in the investigation report.

The obesity problem among seafarers may be approached in many ways. This special group of people lives a life which is different from the population ashore. Most Danish seafarers are working in periods of about 3 months followed by a 3-month vacation, a life pattern which may contribute to more obesity in seafarers.

A major lifestyle problem in the merchant fleet is the limited the possibilities for physical exercise on board the vessels beyond the exercise provided by daily work. Many merchant vessels, especially those of small and medium size, do not have a gymnasium on board, while most large vessels, including passenger ships, do. In this study there was no marked weight difference between seafarers on large ships and those on small and medium size vessels and minor difference between officers and crew. Hence, obesity is obviously a problem for the entire seafaring community and not limited to a certain field or group of seafarers.

The study shows that if a certain limit for maximal BMI is set, e.g. 35.0, it will affect a substantial number of seafarers who will be “grounded” (loss of license) for this reason. Norway introduced a BMI limit of 35.0 on 1<sup>st</sup> January 2002 (9), although the authorities shortly afterwards opened up for exemptions (10). The use of fixed limits without exemptions will thus have wide implications. A more pragmatic approach would be preferable to avoid serious personal consequences for those affected. Instead of fixed limits, we propose that seafarers with severe obesity should have their physical capacity evaluated to determine to what extent the obesity affect their possibility of performing certain essential safety procedures aboard.

### **Preventive initiatives**

As a consequence of the present study, several initiatives were launched. The Danish Maritime Occupational Health Service has recently published a cookbook which has been sent to all Danish merchant vessels (11). The included recipes comply with general nutrition recommendations, but do not all/necessarily have a low calorie count. The cookbook is a binder, which makes it easy to add recipes. Furthermore, special inspirational courses for cooks have been arranged. The cooks participates a two-day course where, among others, nutrition experts teach cooking with special focus on healthy food that can be served in a delicate way.

Besides, the Danish Maritime Occupational Health Service participates in projects with focus on healthy living, together with a number of Danish shipping companies.

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