# UNIVERSITY OF PIRAEUS

## DEPARTMENT OF MARITIME STUDIES M.Sc. in SHIPPING MANAGEMENT

# EXPLORING THE IMPACT OF HEALTH, SAFETY, AND WELL BEING ON SEAFARERS OCCUPATIONAL EFFECTIVENESS.


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**THREE-MEMBER COMMITTEE OF INQUIRY.**

"This Diploma Thesis was unanimously approved by the three-member Examination Committee appointed by the General Assembly of the Department of Maritime Studies of the University of Piraeus in accordance with the Rules of Procedure of the Postgraduate Program in Maritime Management.
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## Abstract

This research delves into the experiences of seafarers concerning their health, safety, and well-being, examining how these aspects are influenced by the organization and structure of their employment at sea. Maritime work comes with its own set of unique characteristics, including long work hours, unpredictable schedules, and social isolation—features that have been linked to declines in employee health, safety, and well-being in other sectors. Additionally, the landscape of maritime employment has undergone significant transformation in recent years; most modern-day seafarers are now contracted through third-party agencies on a temporary basis, a practice that has been linked to diminished occupational health outcomes in land-based industries.

To examine these factors, the study employs a mixed-methods research design that incorporates both semi-structured interviews with seafarers from four different ships and a secondary analysis of safety data from three shipping companies. The research found that seafarers' health, safety, and well-being were closely tied to the organization of their employment and varied according to specific phases within a work tour. Specifically, negative impacts on well-being were most noticeable both early and late in a tour, while safety outcomes improved notably in the last week of duty, especially for those working on offshore vessels.

Further qualitative scrutiny revealed significant links between adverse health, safety, and well-being experiences and the organization of seafaring employment. The study identified a lack of effective strategies for managing these critical factors, highlighting significant disparities between the experiences of seafarers and the expectations set by their shore-based management. Moreover, the mechanisms for reporting such discrepancies were found to be insufficient.

## List Of Acronyms And Abbreviations

3/O Third Officer

AB Able Seaman

ACTU Australian Council of Trade Unions

AIS Automatic Identification System

BIMCO Baltic and International Maritime Council

BSA British Sociological Association

BSc Bachelor of Science

CAQDAS Computer Assisted Qualitative Data Analysis CCR Cargo Control Room

CI Confidence Interval

CoC Certificate of Competency

DMA Danish Maritime Authority

ECDIS Electronic Chart Display and Information System FAC First Aid Case

FLASCI Flag State Conformance Index

FOC Flag Of Convenience

HIV Human Immunodeficiency Virus

HR Human Resources

HSE Health and Safety Executive

HSEQ Health, Safety, Environment and Quality

HSSE Health, Safety, Security and Environment

ILO International Labour Organization IMO International Maritime Organization

INTERTAN International Association of Independent Tanker Owners KO

ISM International Safety Management

ISPS International Ship and Port Facility Security

ITF International Transport Workers

JDCS Job Demand Control Support

LTI Lost Time Incident

LTIF Lost Time Incident Frequency

LWC Lost Workday Case

MAIB Marine Accident Investigation Branch

MAROF Marine Officer

MARPOL International Convention for the Prevention of Pollution from Ships MCA Maritime and Coastguard Agency

MLC Maritime Labour Convention

MoU Memorandum of Understanding

MTC Medical Treatment Case

NHS National Health Service

OCIMF Oil Companies International Marine Forum

OECD Organisation for Economic Cooperation and Development

OOW Officer Of the Watch

P&I Protection and Indemnity

POEA Philippines Overseas Employment Administration RWC Restricted Work Case

SIRC Seafarers International Research Centre

SIRE Ship Inspection Report

SOLAS International Convention for the Safety of Life at Sea SREC School Research Ethics Committee

STCW International Convention on Standards of Training, Certification and Watch keeping for Seafarers

TRC Total Recordable Cases

TRCF Total Recordable Case Frequency

UAE United Arab Emirates

UK United Kingdom

UNCTAD United Nations Conference on Trade and Development USA United States of America

VLCC Very Large Crude Carrier

# Introduction

The objective of this investigation is to scrutinize the experiences related to health, safety, and well-being among seafarers, focusing on how these are shaped by the structuring of work and employment in maritime settings. The seafaring profession is pivotal for global trade, handling over 90% of it, according to data from the International Maritime Organization (IMO) in 2012. The history of this sector is as old as civilization itself, with diverse groups from Phoenicians to the Vikings and beyond having contributed to exploration and trade through naval routes (IMO 2012, p.6). The industry is substantial, employing around 1,647,500 seafarers as noted by BIMCO in 2015.

Evidence highlights the elevated risks in the maritime industry. For instance, between the years 2003 and 2012, seafarers on British-flagged ships were found to be twenty-one times more susceptible to fatal workplace accidents than their counterparts in other sectors within Great Britain (Roberts et al., 2014). Additionally, rates of non-lethal injuries are alarmingly high, with seafarers facing a 70% increased likelihood of personal injuries compared to workers on land (Hansen et al., 2002).

Furthermore, the profession places seafarers at a heightened risk of suicide relative to other jobs. Work at sea also encompasses attributes that are known to negatively influence well-being. Seafarers are among the most physically and socially isolated occupational groups across the globe (Oldenburg et al., 2010). They endure extended separations from their families and home life. Other environmental stressors, including noise, vibration, and ship movement, also take a toll on seafarers' well-being, affecting them during both their work and rest periods (Oldenburg et al., 2010).

While some hazardous aspects of maritime work, such as inclement weather and social isolation, have remained consistent over time, the industry has undergone significant transformations since the 1970s. Previously, shipping companies were often family-owned, operating ships connected to specific ports, and their crews were mostly national workers who stayed with the same company throughout their maritime careers. However, the modern landscape of seafaring has shifted drastically (Sampson, 2013). Ships have increasingly been registered under Flags of Convenience, weakening the traditional ties between the flag of a ship and the nationality of its ownership.

Furthermore, there's been a substantial change in the demographics of the seafaring workforce. In contrast to earlier times when the majority hailed from traditional maritime nations like the United Kingdom, contemporary seafarers often come from emerging

economies, notably China and the Philippines (BIMCO, 2015). These workers are commonly recruited through employment agencies in their home countries rather than being directly hired by the shipping companies for which they work (Walters and Bailey, 2013), thus eroding the national linkage between ship owners, the flags under which their vessels sail, and the crew members themselves.

More and more, modern-day seafarers often find themselves employed temporarily, although for a minority from wealthier nations, stable, long-term jobs are still a possibility. They're typically assigned to a variety of vessels, sometimes even ones operated by different shipping companies. As a result, their work schedules can either be regular (for those in permanent roles) or sporadic (for those in temporary roles). The length of these intensive work periods at sea can vary significantly, ranging from a week to over nine months, influenced by multiple variables like nationality and the recruiting agency involved. It's not rare to find two seafarers on the same vessel, in the same role, serving vastly different tour durations.

While on these tours of duty, seafarers face long daily work hours. A study pointed out that participants worked an average of 67 to 70 hours weekly, often working seven days a week (Jensen et al., 2006). Given that the maritime industry operates around the clock, work hours are frequently divided into shifts. Many seafarers follow patterns like 4 hours on/8 hours off or 6 hours on/6 hours off. Research has noted that fatigue is a common issue among these workers (Smith et al., 2006).

Moreover, studies focusing on the offshore oil and gas sector have identified correlations between the severity of injuries and the consecutive days spent offshore (Parkes and Swash, 1999). Similar research in the maritime sector indicates a relationship between the incidence of injuries among seafarers and the length of time spent on board (Hansen et al., 2002; Jensen et al., 2004).

Given this context, this investigation aims to answer the following research question: What impacts do the organization of work and employment have on seafarers' health, safety, and well-being? To explore this, the study concentrates specifically on seafarers' work patterns and experiences throughout their tours of duty. The overarching goal is to enhance understanding in this critical but under-researched academic area. To address these concerns, a mixed-methods approach involving interviews with seafarers and analysis of safety records from three shipping companies is employed. Findings will be discussed, conclusions drawn, and potential solutions for identified issues will be reflected upon.

The thesis comprises six main chapters. The first two chapters provide a literature review. Chapter one delves into the nature of the seafaring industry and labor market,

emphasizing the prevalence of precarious employment. Understanding the structure of the industry is crucial to evaluating how it affects seafarers' health, safety, and well-being.

The latter portion of this chapter discusses challenges specific to regulating occupational health and safety in the maritime sector. It underscores issues, like the extraterritorial status of seafarers, which affect their protection. This sets the stage for chapter two, focusing on occupational risks and the challenges faced by those who work at sea.

The initial section of chapter two explores occupational injuries and illnesses, as well as general well-being. It aims to present the current state of occupational health, safety, and well-being at sea, distinguishing between three primary areas: occupational injuries, ill-health, and well-being. It provides insights into what is known and what remains unknown regarding these areas.

The latter part of the chapter explores how the organization of work and employment influences occupational health. It considers time-related factors like shift lengths and highlights correlations between work patterns and injury frequency. Drawing from several key studies, it looks at fatigue patterns throughout an entire tour of duty and the negative effects of travel and jet lag on seafarers. Finally, it discusses seafarers' perceptions of risk at both the beginning and end of a tour of duty, again emphasizing the relationship between work organization and health, safety, and well-being outcomes.

Chapter three elaborates on the research methodologies employed in this study. It examines key techniques adopted in related scholarly works and critically evaluates the merits of utilizing a mixed-methods approach. The chapter further lays out the data-gathering techniques implemented specifically in this research. It outlines the qualitative aspect of the study, which involves semi-structured interviews with seafarers, and furnishes details on how this particular component was executed. Additionally, this chapter offers an overview of the ethical considerations that were accounted for during the course of the study.

Chapters four, five, and six serve as the analytical core of the thesis, dissecting the gathered data. Chapter four is the first of two chapters that showcase the qualitative insights gained through semi-structured interviews with seafarers. It provides a glimpse into the everyday life of a seafarer, grappling with the intricate realities of maritime work and life. This chapter brings into focus the seafarers' experiences with various elements of employment structure and work organization at sea, such as precarious employment conditions and the length of their tours of duty, and how these factors affect their health, safety, and well-being. Insights in chapter four also act as a contextual backdrop for the data interpretations presented in chapters five and six.

Chapter five is mainly dedicated to sharing the results from the study's quantitative segment. These results stem from an in-depth secondary analysis of safety and human resource data from three shipping companies. The chapter examines and juxtaposes the frequency of occupational injuries among seafarers with diverse work patterns. By scrutinizing the correlation between the duration of seafarers' tours and the incidence of injuries using company-specific data, this chapter delves into what these statistics reveal about the influence of work scheduling—a crucial aspect of employment and work organization—on the safety outcomes for maritime employees. Subsequent chapters will examine these findings in conjunction with the experiences shared by seafarers in the qualitative portion, allowing for a comprehensive understanding of the degree to which these corporate datasets accurately reflect the work-related risks inherent in maritime employment. A major strength of this study lies in its utilization of seafarers' own definitions of these important periods within a tour of duty, as discerned from interviews. By zeroing in on these specified time frames, chapter six uncovers several issues, such as scheduling unpredictability and location ambiguity, reported by the seafarers who participated. It also identifies discrepancies between what seafarers expect and what their employers contractually promise.

The concluding chapter underscores the primary findings of this investigation. It includes reflective commentary on the research process and suggests potential strategies for tackling the identified issues. These recommendations encompass enhancements in the methods used by shipping companies to document injury data, among other aspects.

# Chapter I. Maritime Workforce and Industry

This chapter embarks on a journey through two pivotal dimensions. Firstly, it delves into the character and intricacies of the maritime industry, as well as the organization of life and work on the high seas. The existing literature offers insights into the evolving dynamics between shipowners and seafarers, capturing the transformation of employment relationships over time. In doing so, the chapter takes into account writings that focus on the sourcing of labor within the maritime sphere and the terms and conditions that govern maritime employment. In dissecting the maritime industry, this chapter shines a spotlight on the ramifications of registering ships under flags of convenience, thereby severing the national affiliations between ship owners, the flags under which their ships sail, and the crews that man them. The literature underscores that such practices have profoundly altered the maritime industry's landscape, with ripple effects on work and employment conditions at sea. Nevertheless, a knowledge gap exists concerning how these monumental shifts correlate with the experiences of occupational health, safety, and well-being among maritime workers.

Secondly, for a holistic understanding of the health, safety, and welfare of seafarers, it is crucial to grasp the extent and mechanisms of their protection. A large portion of maritime labor occurs beyond the scope of any single nation's jurisdiction, making the regulation of this essentially global industry inherently complex. In the latter part of this chapter, research focusing on the intricacies of governing such a globally dispersed industry is analyzed. Recent efforts aimed at enhancing seafarers' protections, including instruments like the Maritime Labour Convention of 2006, are also scrutinized.

By offering a sweeping and thorough review of existing literature on the maritime industry's organizational structure, the employment conditions of seafarers, and protective measures in place for those working at sea, this chapter cultivates a nuanced understanding of the extent and nature of controllable elements within the maritime sector. Consequently, the chapter instigates questions concerning power dynamics, not only among coworkers onboard a ship but also within the broader maritime labor market.

## 1.1 The Evolution of the Maritime Sector

In the year 1970, the global volume of marine-based international trade stood at an approximate 2.6 billion tons of cargo, as per UNCTAD's 2016 data. Fast forward to 2015, and

this figure has soared to an astounding 10 billion tons, signifying a monumental expansion in seaborne trade over the past several decades. This transformation has radically reshaped the face of the maritime industry. Traditionally, maritime enterprises were primarily located in economically advanced nations such as Norway and the United Kingdom. In these countries, ships were not only owned but also constructed, managed, and manned by citizens, and sailed under the national flag.

However, the contemporary landscape has shifted dramatically. Data from UNCTAD in 2016 reveals that the leading five nations owning the largest portions of the global fleet were Greece, Japan, China, Germany, and Singapore. Collectively, these nations held ownership of nearly half the world's total fleet. Interestingly, the five most dominant fleets, as identified by their flags of registration, were Panama, Liberia, the Marshall Islands, Hong Kong (China), and Singapore. These five countries registered an impressive 57% of the world's fleet. Consequently, the traditional alignment between a ship's place of ownership and its flag of registration has been effectively dissolved. The freedom granted to ship-owners to register their ships under any flag has given rise to an extensive proliferation of Flags of Convenience (FOCs). By 2016, an overwhelming 70.2% of the world's merchant vessels were flagged in a country different from that of the ship's ownership.

Recent scholarly works indicate that FOC registration offers multiple advantages to ship-owners. From an economic standpoint, it is less expensive to register ships under these flags due to more affordable registration fees and reduced tonnage tax rates (Lillie 2004). In addition, Lillie's 2004 study elucidates that such nations often have lax regulatory frameworks, thus allowing ship-owners to comply with more lenient regulatory stipulations. These very regulations and the inherent challenges in governing a globally spread industry will be discussed in detail in the latter portions of this chapter. Prior to that, the chapter will delve into the current employment terms and conditions confronting today's seafarers as well as the makeup of modern ship crews.

### 1.1.1 Employment Conditions in the Maritime Workforce

According to 2015 statistics from BIMCO, there's a global workforce of about 1,647,500 seafarers. Data from UNCTAD in 2016 shows that the major labor suppliers to this sector are China, the Philippines, and Indonesia. As depicted in Table 1, the seafarer supply—officers and ratings alike—varies across different geographic regions. Though the utilization of foreign labor in shipping isn't new—British ship owners, for instance, have been employing

foreign crew since the mid-19th century (Coles 2002)—recent years have seen owners broadening their recruitment horizons considerably. This has led to a decline in seafarers from traditional maritime nations and a disconnection between a vessel's country of ownership and its labor force. Sampson's 2013 study outlines how ship owners now frequently engage third-party crew agents, primarily based in less economically developed countries, for local recruitment, thereby altering the dynamics of global seafarer employment dramatically.

| Area | Officers | Ratings |
|---|---|---|
| OECD Countries | 23% | 14% |
| Eastern Europe | 17% | 14% |
| Africa and Latin America | 8% | 9% |
| Far East | 39% | 55% |
| Indian Sub-Continent | 13% | 8% |

*Table 1. Estimated global seafarer supply by broad geographical area (adapted from BIMCO 2015 [online]).*

The engagement of seafarers via local crewing agencies has far-reaching implications for employment practices within the maritime industry. It has given rise to what could best be characterized as precarious employment conditions. The International Labour Organisation (2001) gathered data from 4,525 seafarers and found that most were under contracts lasting for just one tour of duty. Research by Bloor and Sampson (2009, p.713) adds that the type of contractual relationships for outsourced labor can differ among operators and sectors but usually only high-ranking officers enjoy long-term employment, while mid-ranking officers and crew are typically employed under short-term contracts, albeit registered with the crewing agencies.

Studies on precarious employment in terrestrial sectors indicate a correlation with detrimental health and safety outcomes. Quinlan et al. (2001) reviewed 93 studies and found in 76 of them that precarious employment is linked to deteriorating worker health and safety, whether it be injury rates, risk of disease, exposure to hazards, or lack of awareness of occupational safety protocols. The study identified three main risk factors contributing to this: economic incentives, organizational disarray, and a higher likelihood of regulatory

shortcomings. These factors include elements such as competitive bidding, ambiguity in work protocols, and inadequacies in conventional regulatory mechanisms (Quinlan et al. 2001, p.345).

Another inquiry by Lewchuk et al. (2003) studied over 400 workers engaged in precarious employment in Canada, focusing on 'employment strain', a term they coined to encapsulate unique stressors related to such employment. This concept includes seven elements like uncertainty about future earnings, work location, and skill utilization. Lewchuk et al. (2003, p.29) based their model partly on Karasek's (1979) Job Demand Control model, which posits that lower control over job circumstances intensifies work-related stress. The study revealed that scheduling uncertainties were linked with negative health effects. These findings raise pressing questions for seafarers, the majority of whom find themselves in precarious, single-tour employment arrangements.

While there are adverse outcomes concerning health, safety, and well-being linked to precarious employment, permanent jobs aren't always available to every seafarer. For instance, in the Philippines, specific guidelines govern that seafarers' contracts start when they leave the country and end when they return, lasting no longer than 12 months, with any extension requiring mutual consent. This effectively prevents Filipino seafarers from securing permanent positions.

However, employment situations differ globally. Some seafarers do enjoy stable, permanent jobs with shipping firms. Research by Ellis et al. (2012) disclosed a strong correlation between the nationality of the seafarer and the nature of their employment. For example, 75% of all respondents were on temporary contracts, but among British respondents, only 21% were on short-term contracts. Rank and ship type also influenced employment type but to a lesser extent.

Those seafarers on permanent contracts experience structured cycles of time at sea and time at home. Current research shows that leave-to-work ratios are influenced by both rank and nationality. Conversely, seafarers on short-term contracts—often known as voyage contracts—are on board for a fixed term before returning home to seek new opportunities. Their home stays are largely dictated by the availability of subsequent contracts.

Recent studies also indicate that deployment durations vary based on several factors like ship type, rank, nationality, and the recruiting crewing agency. For example, Oldenburg et al. (2009) reported that European seafarers usually serve between three to six months, while non-European seafarers serve six to nine months.

Seafarers from economically disadvantaged nations are often willing to accept longer tours because any onboard job is better than facing widespread unemployment at home. Wage differences also contribute. Lillie (2004) compared the average monthly wage of an industrial worker in the Philippines to be $140, whereas a Filipino able seaman earned a median monthly wage of $1025.

This willingness to accept less favorable employment conditions poses risks, especially concerning occupational health and safety. As Sampson (2013) noted, crew members often come from impoverished backgrounds, which lowers their expectations regarding working conditions.

Employment patterns among seafarers also have implications for the types of ships on which they work. Professional qualifications differ: officers must hold a Certificate of Competency, the requirements for which vary by country. These certificates may have geographic or tonnage limitations but do not restrict ship types. Basic certifications in areas like firefighting and first aid are also required across the industry, allowing for employment on various ship types.

Therefore, the seafaring workforce offers what Leong (2012) called "functional flexibility," allowing workers to shift between different industry sectors. This flexibility is beneficial for employers in case of labor shortages, but it also signifies the industry's lack of commitment to seafarers. This flexible approach to seafaring labor aligns with labor process theory, which sees the workforce as a resource to be optimized for economic benefit. This flexibility and instability create concern for seafarers, particularly regarding employment uncertainty, and these are organizational features that are likely to affect their overall occupational health, safety, and well-being.

### 1.1.2 Shipboard Organizational Structure

Aboard vessels, crew members are categorized into either officers or ratings, with ratings occupying positions that demand lesser levels of specialized maritime training (Glen 2008). Individuals in trainee officer roles are commonly known as Cadets. According to a 2016 study, approximately 51% of maritime roles were designated for officers, while the remaining 49% were for ratings (UNCTAD 2016).

Every crew member aboard a ship holds a distinct role, and there is a remarkably rigid hierarchical system within the maritime industry. This hierarchy dictates that officers and ratings have separate areas for socialization and dining. Though Figure 1 illustrates a general

onboard rank structure, it’s worth noting that some vessels feature minor variations to this arrangement.

Crew members share confined spaces, generally divided into five key areas: the bridge, engine room, living quarters, weather decks, and cargo holds. Off-duty seafarers are usually located in the living quarters, which encompass sleeping cabins and dining rooms. Contemporary vessels often provide single-occupancy cabins with private bathrooms. However, no space is truly private; even individual cabins can be entered by the Captain and are subject to routine inspections, as mandated by the Maritime Labour Convention (2006)—a topic further discussed in section 1.2.1. As Sampson (2013, p. 122) highlights: "For many maritime professionals, the ship isn't considered a home or community, but merely a functional workspace where survival is the main focus until their contract expires."

The specific tasks performed by crew members vary by their role. The Captain is responsible for the overall governance and safe operation of the ship. Deck officers like the Chief, Second, and Third Officers, mainly navigate the ship and execute the planned journey, spending most of their work time on the bridge, often in two watchkeeping shifts within a 24-hour period (Sampson 2013). Deck ratings, under the supervision of a Bosun, assist in night lookout and steering responsibilities. While docked, they partake in cargo operations and maintain security.

Engineering officers and engine ratings focus on routine upkeep and supervision of machinery in the engine room. Conversely, the Chief Cook and Messman typically manage domestic tasks such as food preparation and cleaning.

The specific nature of duties also diverges between various types of ships. For example, on tankers, deck officers handle cargo pumps, while on passenger ships, they oversee the safe disembarkation of passengers.

Regardless of their roles, seafarers don't just work in these spaces; they also live and socialize in them for extended durations. The number of crew members can fluctuate, and the minimum required crew is determined by the flag state, following safe manning rules (ILO, 2006). Ship owners have a vested interest in the flag state's decisions on manning levels. An article by the Nautical Institute clarifies that flag states assess and potentially approve manning proposals by ship companies, affecting their competitiveness (Bowring 2006, p.11).

In research that examined crew sizes without differentiating between flag states, Winchester et al. (2006) found that the average number of crew members on tankers ranged from 11.7 to 25.0. Similar findings were reported concerning the crew sizes on dry cargo ships, with averages ranging between 10.0 and 25.7 crew members.

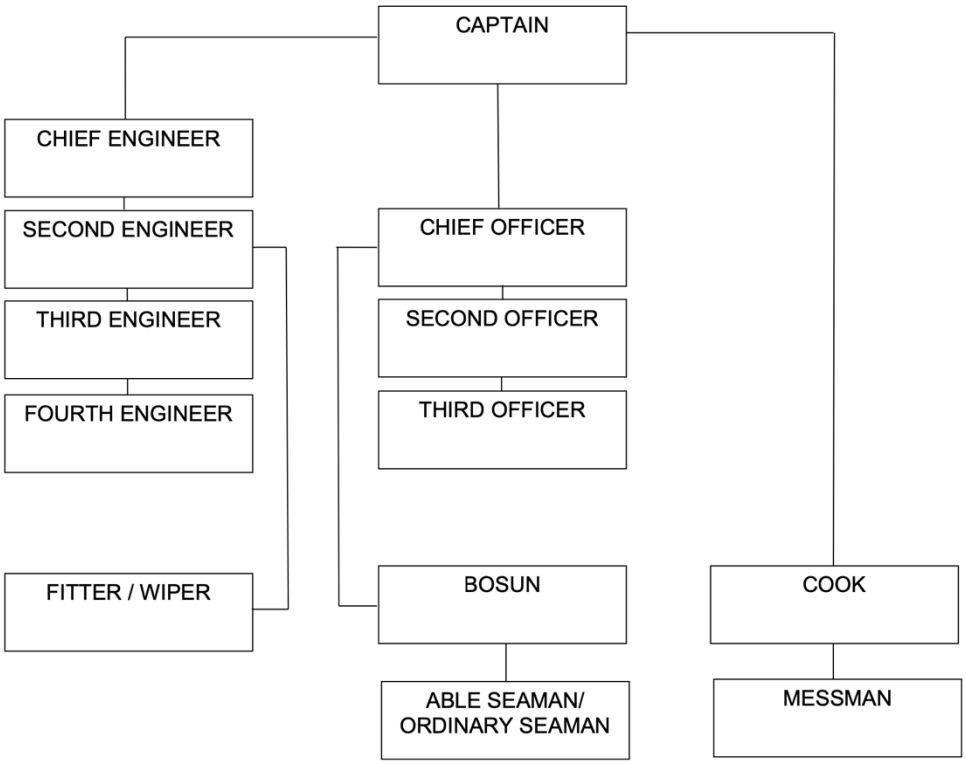


*Figure 1. Onboard occupational hierarchy*

People onboard these ships may hail from any country, and research by Wu and Winchester (2005) has shown that multi-national crews—comprising individuals from at least three different nationalities—are now quite common. This diversification has been facilitated by global networks among ship owners, manning agencies, and national labor markets, as elaborated in section 1.1.1 above. However, multi-national staffing presents communication challenges; while English is the universal maritime language, it's not the mother tongue for many seafarers. Studies, such as the one by Sampson and Zhao (2003), have highlighted that this language barrier could potentially lead to miscommunication, which in turn may result in both occupational and social issues. Some seafarers in this study recalled instances where misunderstandings occurred due to communication gaps regarding tasks or needed tools.

Interestingly, despite apprehensions about communication difficulties and cultural clashes, some research shows that seafarers often prefer working in a multi-national

environment. According to Sampson and Zhao (2003), seafarers perceive that multi-national teams lessen the chance of conflict. This perception is linked to the idea that social distance increases tolerance and respect within culturally diverse teams. However, a questionnaire on seafarer stressors by Oldenburg et al. (2009) found varied attitudes towards multicultural crews: 39.5% positive, 5.5% negative, and 55% neutral. Notably, the study revealed significant differences between European and non-European seafarers, with only 25.2% of non-Europeans viewing multicultural crews positively and over 70% remaining neutral.

Regardless of the seafarers' nationalities or the flag under which the ship operates, rest periods for all sea workers are mandated by the Maritime Labour Convention (2006), discussed in detail in section 1.2.1. This Convention stipulates a minimum of 10 hours of rest daily and 77 hours weekly for every seafarer. Importantly, the rules specify that "rest hours should be broken into no more than two intervals, one of which must be at least six hours long, and the gap between two rest periods cannot exceed 14 hours" (ILO 2006, p.31). It's peculiar to the maritime industry that minimum rest hours are defined, rather than maximum working hours. The actual work hours depend on various factors, including ship type, crew size, and frequency of port stops. Table 2 in the next section provides a sample of shipboard working arrangements as mandated by the Seafarers' Hours of Work and the Manning of Ships Convention (commonly known as ILO 180), offering insight into a typical seafaring work schedule.

Additionally, multiple studies have identified that actual rest hours are often underreported. Seafarers sometimes record their rest hours to meet formal requirements, not necessarily reflecting the real rest hours they have. A study by Bloor (2003) concerning global governance in the maritime industry claims that the falsification of seafarers' work and rest hours is a known issue. This raises significant questions concerning the safeguarding measures for those who work at sea, a subject that this chapter will further explore.

| Position/rank | Scheduled daily work hours at sea | | | Scheduled daily work hours in port | | Total daily rest hours | |
|---|---|---|---|---|---|---|---|
| | Watchkeeping | | Non-watchkeeping duties | Watchkeeping (from - to) | Non-watchkeeping duties (from - to) | At sea | In port |
| | (from-to) | (from-to) | (from-to) | | | | |
| Chief Officer | 04.00 - 08.00 | 16.00 - 20.00 | 08.00 - 10.00 | | 06.00 - 18.00 | 14 | 12 |
| Second Officer | 00.00 - 04.00 | 12.00 - 16.00 | 10.00 - 12.00 | 00.00-06.00 / 12.00-18.00 | | 14 | 12 |
| Third Officer | 08.00 - 12.00 | 20.00 - 24.00 | 13.00 - 15.00 | 06.00-12.00 / 18.00-24.00 | | 14 | 12 |
| Bosun | | | 06-12, 13 – 17 | | 06.00 - 18.00 | 14 | 12 |
| AB (Watchkeeper) | 04.00 - 08.00 | 16.00 - 20.00 | 08.00 - 10.00 | 00.00-06.00 / 12.00-18.00 | | 14 | 12 |
| AB (Watchkeeper) | 00.00 - 04.00 | 12.00 - 16.00 | 10.00 - 12.00 | 06.00-12.00 / 18.00-24.00 | | 14 | 12 |
| AB (Watchkeeper) | 08.00 - 12.00 | 20.00 - 24.00 | 13.00 - 15.00 | 00.00-06.00 / 12.00-18.00 | | 14 | 12 |
| AB (Day man) | | | 06-12, 13-17 | 06.00-12.00 / 18.00-24.00 | | 14 | 12 |
| OS | | | 06-12, 13-17 | | 06.00-12.00 / 13.00-17.00 | 14 | 14 |
| Chief Engineer | | | 08-12, 13-17 | | 08-12, 13-17 | 16 | 16 |
| Second Engineer | | | 08-12, 13-17 | | 08-12, 13-17 | 16 | 16 |
| Third Engineer | | | 08-12, 13-17 | | 08-12, 13-17 | 16 | 16 |
| Motorman | | | 08-12, 13-17 | | 08-12, 13-17 | 16 | 16 |
| Cook | | | 06-13, 15-18 | | 06.00-13.00 / 15.00-18.00 | 10 | 10 |
| Mess man | | | 06-13, 15-18 | | 06.00-13.00 / 15.00-18.00 | 10 | 10 |

*Table 2. Shipboard working arrangements (adapted from ILO 1996 (online)*

## 1.2 Ensuring Seafarer Safety

The latter portion of this chapter delves into the manifold methods designed to ensure the safety, health, and well-being of seafarers. It offers an overview of the regulatory framework that serves as the backdrop for the mechanisms aimed at promoting and protecting the welfare of those who work at sea.

Initially, the section provides a comprehensive breakdown of the primary regulatory tools of global governance that influence the rules around occupational health and safety within the maritime sector. Such regulations encompass laws related to labor standards, environmental sustainability, safety protocols, and training courses. Specifically, those instruments that hold the most weight in terms of safeguarding the health and safety of seafarers are highlighted.

Subsequently, the discussion pivots to examine the respective roles of flag state and port state control in ensuring seafarer welfare. Defined by the OECD in 2003 as the "country where a sea-going vessel is registered," the flag state holds jurisdiction to enforce regulations on vessels operating under its flag. The International Maritime Organization (IMO) stated in 2017 that port state control refers to the "inspection of international ships in domestic ports to

ascertain whether the vessel's condition and its equipment adhere to international regulations, and if the crew is operating the vessel in compliance with such rules." Port state control, especially, is vital in the context of preserving the health, safety, and well-being of seafarers.

Lastly, the section wraps up by addressing the role of private entities in regulating health and safety on the high seas, and identifying the major stakeholders currently active in this sphere. Among these are classification organizations, Protection and Indemnity (P & I) clubs, as well as labor unions. Walters and Bailey (2013, p.123) note that "in land-based industries, interactions within the supply chain are increasingly seen as a potential tool for enhancing worker conditions." As such, the contributions of supply chain entities like major oil companies are also scrutinized. These private entities are especially crucial given the limitations of state-based regulations in a globally connected industry.

### 1.2.1 Global Regulatory Frameworks in Maritime Safety and Health

Internationally, the seafaring sector's health and safety regulations are governed by two key United Nations specialized agencies: the International Maritime Organization (IMO) and the International Labour Organization (ILO) (Walters and Bailey 2013). The IMO primarily focuses on maritime treaties, while the ILO specializes in labor standards. A pivotal IMO convention for maritime safety is the International Convention for the Safety of Life at Sea (SOLAS) 1974. Considered the cornerstone for maritime transport legislation, SOLAS was augmented in 1994 by the IMO with a chapter known as the ‘Management for the Safe Operation of Ships,’ universally referred to as the ISM Code. This Code transitioned the responsibility of managing seafarer health and safety from maritime administrations to the shipping companies themselves. The ISM Code stipulates that a Safety Management System must be established by shipping companies globally, representing a paradigm shift from a former prescriptive approach to regulation (Bailey 2006). This has brought the maritime sector into alignment with land-based industries, which have adopted similar regulatory strategies.

A crucial component of the ISM Code is that shipping companies are mandated to record and investigate accidents. However, research indicates that reported occupational incidents may merely scratch the surface of actual occurrences. A study by Psarros et al. (2010) suggested that only around 30% of incidents on Norwegian-flagged ships were reported, based on data from the Norwegian Maritime Directorate and Lloyd’s Register Fair Play.

Multiple factors contribute to the reluctance among seafarers to report incidents. Bhattacharya (2012) found that seafarers hesitated to report incidents for fear of facing disciplinary action—either directly or indirectly—as it would imply managerial assumption of their culpability. They also wished to protect their colleagues' professional reputations, an additional deterrent to reporting (Bhattacharya 2012). These concerns are heightened by the precarious employment status of many seafarers, an issue outlined in section 1.1.1, leading them to prioritize future job opportunities over incident reporting.

Although SOLAS is the IMO's most renowned legislation, other significant treaties concerning ship safety include the International Convention on Load Lines 1996, focused on the loading capacity of vessels, and the International Regulations for Preventing Collisions at Sea (COLREGS) 1973, akin to terrestrial Highway Codes. Another key IMO convention is the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) 78. STCW sets forth minimum competency prerequisites for specific maritime roles, aiming to standardize ship operations and labor force quality—factors influencing occupational health and safety in the sector. The significance of maintaining such standards is highlighted by multiple studies, including one by the MCA (2010 [online]), that attributed almost all maritime losses to human behavior. Research by Hetherington et al. (2006) listed several human factors impacting safety at sea, such as situational awareness, teamwork, communication, and decision-making.

Given the critical role of human error in maritime accidents, there have been efforts to regulate this aspect, notably through the International Maritime Labour Convention (MLC) 2006. The MLC encompasses four main titles: Minimum Requirements for Seafarers to Work on a Ship; Employment Conditions; Accommodation, Recreational Facilities, and Catering; and Health Protection, Medical Care, Welfare, and Social Security. The MLC (2006) specifies that member states are responsible for overseeing health and safety on vessels registered under their flag, although using flag states as regulatory enforcers in maritime sectors presents its own challenges, as will be discussed subsequently.

### 1.2.2 Role of Flag State and Port State in Regulatory Oversight

Regardless of the volume of existing regulations aimed at the maritime industry, the effectiveness of these rules hinges on their proper implementation and enforcement. In principle, the flag state is intended to act as the chief regulatory authority within the maritime industry, using its certification and inspection systems for compliance (Walters and Bailey

2013). Nevertheless, critics point out that Flags of Convenience (FOCs) often lack both the necessary infrastructure and the genuine intent to ensure adherence to regulations. As highlighted in section 1.1, the practice of flagging ships under FOCs is prevalent, leading to widespread skepticism regarding the efficacy of flag states in enforcing maritime regulations on a global scale. This skepticism has driven some nations to take matters into their own hands, thereby giving rise to another essential regulatory body: port state control.

Port state control involves inspectors who board vessels in port to verify compliance with international conventions such as STCW and SOLAS. Various actions can be taken by these inspectors if they find deficiencies, ranging from future denial of entry into their national ports to detaining the vessel until necessary corrections are executed.

Internationally, Memorandums of Understanding (MOUs) have been instituted among states within specific regional groupings. As of 2017, there exist nine regional MOUs as reported by the IMO: Paris, Tokyo, Abuja, Caribbean, Black Sea, Mediterranean, Indian Ocean, Riyadh, and Acuerdo de Vina del Mar (Latin America). These MOUs are designed to achieve a balance: inspecting as many ships as possible while avoiding unnecessary delays through repeated inspections (IMO 2017 [online]). The Paris MOU categorizes flag states by risk: the 'white list' includes high-quality flags, the 'black list' covers medium-to-high-risk flags, and the 'grey list' features flags that fall between quality and medium risk (ParisMOU 2017). In the year 2015, out of 73 flag states, 43 made it to the white list, 19 were on the grey list, and 11 were on the black list (ParisMOU 2017).

However, port state control as a mechanism for enforcing international maritime regulations isn't flawless. A study that observed port state inspectors in Russia, India, and the UK showed considerable variation in inspection procedures across different ports, countries, and even among individual inspectors (Bloor 2003). Moreover, according to the Paris MOU's 2014 annual report, port state control hasn't been wholly successful in eradicating substandard ships—an issue flagged by Bloor as early as 2003. Paris MOU itself admitted in its 2003 report that more work is required to substantially lower the number of substandard vessels (Paris MOU 2003 [online]).

On a more positive note, a Swedish study by Cariou et al. (2008) found that subsequent inspections showed a 63% reduction in deficiencies following an initial inspection. While this suggests that port state control has contributed to the improvement of some ships—evidenced by the banning of 63 vessels in Paris MOU ports between 2012 and 2014—it also highlights existing limitations in ensuring the well-being of seafarers. These shortcomings underscore the

need for a more comprehensive understanding of the variables that adversely affect the health, safety, and overall well-being of maritime personnel.

### 1.2.3 Private Regulatory Mechanisms

In this concluding sub-section, the focus is on the literature related to the private oversight of health and safety within the maritime industry. Certain aspects of private regulation, such as the involvement of classification societies, predate even state-based regulation. These societies have a symbiotic relationship with risk evaluation and insurance, conducting periodic inspections to ascertain that ships comply with specific standards. When a ship receives certification for meeting these standards, insurance companies can then categorize the ship's risk level. This, in turn, allows ship owners to secure insurance for the ship's hull and machinery. To maintain this insurance, ships must adhere to these minimum standards. Research by Payer (1998) highlighted that these societies contribute significantly to creating uniform structural standards for ships. Furthermore, Walters and Bailey (2013) articulate that the standard-setting activities of classification societies serve to safeguard the health and safety of maritime workers.

Similarly, Protection and Indemnity Clubs (P & I Clubs) are closely aligned with classification societies and cover a broad spectrum of liabilities within the maritime industry. As INTERTANKO (2006), a global association of tanker owners, outlines, these liabilities typically encompass matters like injuries and deaths of seafarers, passengers, and third parties, as well as environmental and navigational liabilities. Functioning on a non-profit basis, these P & I Clubs cover 95% of global sea-going tonnage liabilities (Seward 2002). Beyond insurance, these clubs also engage in advocacy, representing common interests in forums such as the IMO (Seward 2002). DeSombre (2006) indicates that the entry standards for ships into P & I Clubs are stringent, providing an additional layer of private, independent regulatory oversight in maritime affairs.

In certain industry sectors, like the chemical and oil industries, commercial hirers of ships also act as independent regulatory authorities. For instance, the Oil Companies International Maritime Forum (OCIMF), representing major oil corporations, frequently inspects tankers through its Ship Inspection Report Programme (SIRE). According to OCIMF (2014 [online]), the SIRE program serves as a valuable risk-assessment tool. Walters and Bailey (2013 p.124) further note that to secure contracts, tanker companies must maintain and operate their vessels to standards set by these oil majors, including health and safety

management onboard. The failure to meet these standards could lead to a sweeping business denial from the oil majors for the ship owner's entire fleet. Bhattacharya (2009) acknowledges that SIRE inspections are notably rigorous, substantially contributing to the health and safety of seafarers.

Trade Unions, too, contribute to the occupational well-being of seafarers. Studies, such as one by Lillie (2006), emphasize the potency of unions like the International Transport Workers Federation (ITF) in influencing international collective bargaining, including standardized global wages. Lillie (2004) asserts that the ITF has played a pivotal role in this context.

Nonetheless, union representation at the shipboard level is generally deemed weak, posing a concern for the overall well-being of maritime workers (Walters and Bailey 2013). This becomes especially relevant when studies like Walters' (2006) research in the UK show that worker representation on occupational health and safety matters is most effective when directly implemented in the workplace. Therefore, while private regulatory mechanisms play a vital role in safeguarding seafarers, they also come with their own set of limitations. These limitations, when seen in conjunction with those posed by global governance tools and flag and port state controls, point to a compelling need for additional research to address the shortcomings in safeguarding mechanisms and their repercussions for the health, safety, and well-being of seafarers.

## 1.3 Recapitulation

This chapter's literature survey illuminates the significant transformations the maritime industry has undergone over the past fifty years, carrying consequential implications for the present study. Firstly, the traditional association among the ship's flag, the ship owner, and the seafarers on board has eroded. No longer are ship owners engaging local seafarers for long-term employment on vessels registered under their home country's flag. Today's seafarers find themselves in unstable employment conditions, a situation that has been correlated with negative occupational health and safety outcomes in land-based sectors (refer, for instance, to Quinlan et al. 2001).

Furthermore, the rise of Flags of Convenience (FOC) has diluted the effectiveness of flag states in implementing and enforcing international maritime laws, as elaborated in the latter sections of this chapter covering global governance tools within the seafaring sector. This

point is crucial for the scope of this study, as it underscores the flag states' deficiencies in adequately protecting their seafaring workforce.

Consequently, the key takeaway from this chapter's literature review involves the broader organizational and employment structures that define the maritime industry. This chapter furnishes an understanding of the level of control that might be exerted on those working at sea. Such control dynamics, along with the resultant power imbalances and ensuing inequalities, play a pivotal role in shaping the organization of labor and employment. These factors are likely to have a significant bearing on the occupational health, safety, and general well-being of seafarers.

In the subsequent chapter, the focus will shift to scrutinizing the literature related to the organization of labor, particularly patterns of work, and the implications these structural features may have on safety and well-being outcomes for maritime workers.

# Chapter II. Occupational Health, Safety, And Well-Being Of Maritime Workers

This chapter reviews the scholarly work focusing on the occupational health, safety, and overall well-being of individuals employed in the maritime sector. It both outlines what is presently understood about the occupational outcomes in health, safety, and well-being for maritime employees and pinpoints the gaps or fragmented areas in our existing knowledge base. In outlining this, the chapter posits that while some health, safety, and well-being outcomes for seafarers are inherently linked to the perils of the marine environment—such as adverse weather conditions—many of the risks are fundamentally tied to the organization of work and employment at sea.

To elaborate, the initial part of this chapter delves into the diverse facets of occupational health and safety, categorizing them into occupational safety, occupational health issues, and occupational well-being. While the significance of occupational safety and health are broadly recognized, less attention has historically been paid to occupational well-being. Yet, certain aspects of maritime life, like isolation and exhaustion, suggest that seafaring professionals are particularly vulnerable to negative well-being outcomes—many of which can be attributed to the manner in which work and employment at sea are structured. The opening segment thus begins by examining seafarers' occupational safety, citing research that has indicated the maritime occupation to be perilous in terms of the likelihood of fatal accidents or personal injuries. For instance, over the past decade, seafarers were nearly twenty-six times more prone to fatal work-related accidents than other workers in Great Britain (Roberts and Marlow 2005). The segment proceeds to investigate literature on seafarers' health risks. Due to the nature of their occupation, maritime workers face unique health hazards—like exposure to cancer-causing substances—that are uncommon in other professions. Given such hazards, it is hardly surprising that the incidence rates of illnesses like heart disease and respiratory cancers are less favorable for seafarers compared to those in other industries. The first part of the chapter concludes by examining the well-being and psychosocial risks confronted by maritime workers, including stressors which have been linked to the organization of work and employment across different sectors.

The latter portion of this chapter draws upon an extensive range of scholarly literature addressing the organization of work, specifically focusing on work schedules and how their features influence safety and well-being outcomes. In this context, it showcases international research insights concerning temporal factors, such as work hours and times of the day, and

their relationship with safety and well-being metrics. Subsequently, the chapter turns its attention to the frequency of injuries in relation to the timing within a seafaring tour of duty and wraps up by referencing literature that delves into factors pertinent to the early and later stages of a seafarer's tour of duty.

## 2.1 Work-Related Injuries, Health Conditions, and Overall Well-being

The International Labour Organization (ILO, available online in 2008) characterizes occupational health and safety as "the discipline concerned with foreseeing, identifying, assessing, and managing risks that emerge in or from the workplace, which could detrimentally affect the health and well-being of employees, while also taking into account the potential ramifications on nearby communities and the broader environment." During the 2015/16 fiscal year in the United Kingdom, approximately 1.3 million people suffered from an occupational injury, and there were 144 work-related fatalities (HSE 2017). A disparity exists in the risk levels across various professions within the UK. When comparing mortality rates among the thirty riskiest jobs in Great Britain, Roberts (2010) placed merchant seafarers within the top ten most perilous careers. Furthermore, British maritime workers exhibited elevated mortality rates for certain types of cancer—specifically liver cancer and laryngeal cancer—as well as for conditions like cirrhosis and pancreatitis (Office of Populations, Censuses, and Surveys 1995). In a more up-to-date study, Danish seafarers were indicated to face an escalated overall cancer risk, particularly lung cancer, compared to the general populace (Kaerlev et al. 2005). Seafarers were also discovered to be more prone than the general public to adopt detrimental lifestyle habits, such as smoking and excessive alcohol consumption (Parker et al. 1997).

Similarly, the emotional health and overall well-being of seafarers present a significant concern. The incidence of suicide among British seafarers (Mayhew 1999) and their Danish counterparts (Brandt et al. 1994) has been reported to be alarmingly high. Poor mental health and well-being among this workforce is also evident in less extreme manifestations, such as notably elevated rates of job-related stress (Carotenuto et al. 2012) and chronic fatigue (Smith et al. 2006).

Subsequent segments of this chapter will individually explore these three core dimensions of occupational health and safety: work-related injuries, job-associated health conditions, and occupational well-being.

### 2.1.1 Incidents and Hazards in Maritime Occupations

In 2002, the International Maritime Organization (IMO, available online) declared, "the shipping industry is perhaps the most global of all major international sectors and is notably one of the riskiest." This assertion finds backing in data sourced from the Maritime and Coastguard Agency (MCA), revealing that the rate of work-related deaths among seafarers was twelve-fold greater compared to the general labor force (Allianz 2012).

It's crucial, though, to differentiate between two distinct root causes of fatalities in maritime vocations. The first is a maritime catastrophe, which entails an adverse event affecting an entire vessel and everyone on board. Such incidents may stem from circumstances like ship collisions, fires, capsizing, or explosive events. For instance, the 2015 capsizing and sinking of the cement freighter Cemfjord resulted in eight fatalities (Marine Accident Investigation Branch [MAIB], 2016).

The second cause is an occupational death—where a single seafarer, or a small group, undergoes a fatal work-related mishap while engaged in a specific task. These incidents often encompass falls, slips, and trips, which accounted for 43% of reported injuries in a questionnaire survey covering 6,461 seafarers (Jensen et al. 2005).

Historical and consistent data paints a bleak picture concerning seafarer fatalities. For instance, Roberts and Hansen (2002) disclosed that between 1986 and 1995, the relative risk of mortality due to occupational mishaps for seafarers on British-flagged vessels was a staggering 23.9 times higher than for all workers in Great Britain. Comparative studies suggest even grimmer statistics for other fleets; for example, occupational fatality rates on Singaporean and Hong Kong ships between 1981 and 1995 were significantly higher than on British ships (Roberts 1998).

While considerable research has delved into mortality rates among seafarers, less attention has been paid to non-lethal injuries, with a focus more on cumulative rather than incidence rates. In a study examining the lack of standardized data on non-fatal injuries among seafarers, Hetherington et al. (2006) pointed out the absence of a universal reporting system. This issue will be further discussed in Chapter 3.1.1. Consequently, insights are pieced together from disparate individual studies, each of which offers an incomplete perspective.

One such comprehensive study by Jensen et al. (2004) explored seafarers' personal injury rates and found that these rates varied according to factors like nationality, job position on board, and age. Drawing from retrospective questionnaires from 6,461 participants, they found an average injury rate of 9.1%. They estimated that the yearly incidence of seafarers'

injuries could range from 9 to 20%, equating to approximately 180,000 of the 1.2 million seafarers globally sustaining injuries within a year. These findings are aligned with another study by Tomaszunas et al. (1997), which estimated an annual prevalence of 11.5% for seafarers' injuries.

In a separate inquiry, Hansen et al. (2002) examined the impact of demographic variables on seafarers' injury rates aboard Danish-flagged vessels. They utilized insurance data and records from the Danish Maritime Authority to identify correlations between injury rates and factors like age, job function, and department. Notably, those working in the deck department faced the highest injury risks, and the likelihood of sustaining a disabling injury escalated markedly with age.

The same study by Hansen et al. (2002) also explored relationships between the type of vessel and injury occurrence rates. They discovered that seafarers on coasters and roll-on-roll-off ships encountered elevated risk levels compared to those on other vessel types. They also noticed nationality-based variances in accident rates, revealing lower rates among foreign seafarers compared to Danish ones. The authors posited that this discrepancy could be genuine, perhaps rooted in behavioral differences among diverse nationalities in identical work environments. Alternatively, higher underreporting rates among certain nationalities might explain the disparity. Chapter 1.2.1 had previously addressed research indicating widespread underreporting of injuries, especially among seafarers facing precarious employment conditions—factors discussed in Chapter 1.1.1 as related to nationality.

From these collective investigations, it is clear that maritime occupations are fraught with substantial risk. However, the current understanding remains fragmented, signaling an opportunity for deeper exploration into occupational safety aspects of seafarers, especially those tied to their employment conditions that could influence safety outcomes.

### 2.1.2 Health Challenges Faced by Maritime Workers

Progressing further, while seafaring is undeniably a hazardous profession concerning workplace injuries, another complex matter is the health implications of employment in this maritime sector for the labor force.

Seafarers are obligated to undergo regular medical check-ups aimed at identifying and eliminating those with serious health conditions or disabilities (Bloor 2000). As a result, a phenomenon known as the 'healthy worker effect' is observed within the seafaring community. In this dynamic, individuals who are less healthy either voluntarily leave the workforce or are

systematically excluded from entering it. However, due to the specific hazards of their work environment, seafarers encounter unique health risks seldom faced by workers in other sectors. For example, a study by Moen et al. (1995) revealed that seafarers on ships transporting chemical or oil products could be exposed to substances with carcinogenic properties. Thus, it's not entirely surprising that mesothelioma-related deaths were found to be six times more prevalent among Norwegian seafarers working in engine departments compared to the general populace (Eriksen 1999, as cited by Bloor et al. 2000).

Moreover, cardiovascular ailments emerge as a significant health concern for maritime workers. Remarkably, cardiovascular disease was identified as the leading cause of death, responsible for 87% of fatalities among seafarers on British merchant vessels from 1986 to 1995 (Roberts 2008). This is consistent with observations in Polish (Jaremin et al. 1996) and Danish (Hansen 1996) merchant fleets.

Additionally, seafarers have been observed to have comparatively high rates of infectious diseases. The nature of their occupation, which often involves international travel, exposes them to risks of contracting tropical illnesses like Malaria (Roberts and Hansen 2002). In addition to that, like other transient and transport workers, maritime workers experience elevated levels of sexually transmitted infections. Hansen et al. (1996) found an increased susceptibility among seafarers to HIV, Hepatitis A and B, and Tuberculosis.

Investigations like the one conducted by Hansen et al. (1994) have revealed that many health issues faced by seafarers could be linked to their lifestyle choices. Oldenburg et al. (2009) noted that some maritime workers counteract feelings of isolation by engaging in unhealthy behaviors, such as excessive smoking or alcohol consumption. In research focused on Danish seafarers, which utilized data from mandatory health assessments, it was found that the number of overweight individuals was statistically significant when compared to a reference group of land-based workers (Hoeyer and Hansen 2005). In a prior study, Hansen et al. (1994) attributed high obesity levels among seafarers to a decrease in manual labor onboard ships coupled with an increased availability of food. These findings concerning the health of seafarers raise multiple questions related to their lifestyle decisions and work-life equilibrium, highlighting the necessity for more comprehensive research in this domain.

### 2.1.3 Well-being in the seafaring industry

Besides literature that suggests that seafarers face safety and health risks worse than those in other industries, research also underscores significant concerns about their well-being.

Seafarers encounter numerous psychosocial hazards, which can be traced back to the unique characteristics and structure of their work. Stress is a prevalent issue. While common stress factors like significant responsibilities and workload pressures affect workers in most industries, seafarers face additional unique stressors due to the regulated, confined, and isolated nature of their work. Some researchers have even likened the seafaring lifestyle to being imprisoned. In line with this, an Australian study on Fatigue, Stress, and Occupational Health discovered that 60% of surveyed seafarers experienced moderate to high stress levels (referenced in Bloor et al. 2010).

Moreover, the seafaring profession involves extended periods of detachment from home and family, aggravating feelings of social isolation. The diverse cultural backgrounds of seafarers onboard can exacerbate these sensations. Research by Carotenuto et al. (2012) suggested that such isolation could lead to serious psychological difficulties. They particularly noted the emotional toll when family members back home are sick or pass away. Jezewska et al. (2006) corroborated this, pointing out that absence from home was one of the most demoralizing aspects for seafarers.

Poor onboard living conditions also have a detrimental effect on seafarers' well-being. Studies on the influence of the built environment suggest that subpar living accommodations could negatively impact an individual's mental health. Ellis et al. (2012) found that many seafarers described their cabins as inadequately furnished, unclean, and in poor condition, which they concluded could have a harmful effect on seafarers' mental health.

Research further reveals that environmental stressors like noise, vibration, and the ship's motion can adversely impact seafarers' well-being. Such factors often interfere with sleep quality, especially given that ships operate around-the-clock. Survey data indicated that 60% of seafarers reported noise disturbances and 63% complained about vibrations affecting their sleep.

The issue of fatigue is also crucial, as adequate sleep is essential for well-being. One study of the Royal Australian Navy showed 44% of the participants worked over 80 hours weekly, and 62% stated they were sleep-deprived. A New Zealand study found that 61% of officers on inter-island ferries felt fatigued while on duty, and 26% could recall being involved in a fatigue-related incident within the past six months.

Several contributing factors exacerbate fatigue in this industry, such as the irregular work shifts that many seafarers have. For instance, Project Horizon (2012) found that shift patterns of 6 hours on, 6 hours off led to higher fatigue levels than 4 hours on, 8 hours off.

Frequent port calls are also tied to increased fatigue levels among seafarers, as they often have to work additional hours during these periods. Modernization has led to quicker port turnarounds, adding to work pressures. Inspections and increased security measures contribute further to workload and hence, fatigue.

Burnout is another concern. Carter (2005) emphasized that senior officers are particularly vulnerable, with predisposing factors like loneliness and homesickness, which are common among seafarers.

Quantifying the impact of such factors like substandard living conditions, social isolation, and burnout on seafarers' well-being is challenging. However, studies indicate high rates of suicide among seafarers, further emphasizing the dire need for attention to their occupational well-being.

To sum up, the literature shows that the occupational well-being of seafarers is a matter of serious concern that requires immediate improvement and further research. The way seafaring work is organized also implies that the structures of employment have the potential to significantly affect the health, safety, and well-being of those in the industry. Therefore, the following section will present limited research concerning occupational safety and well-being in relation to work patterns.

## 2.2 Work Patterns and Its Impact on Seafarer Safety and Well-being

The safety and well-being of seafarers in the context of their unique work schedules are subjects that merit attention. Several distinct attributes mark the work dynamics in the maritime sector. For instance, seafarers often remain away from their homes for extended durations and are expected to work daily while they are on the ship, rendering it a noteworthy subject for examination.

Moreover, the maritime industry operates ceaselessly, around the clock, throughout the year. Ships keep sailing, and cargo operations persist, irrespective of the hour or day. As articulated by Knudsen (2009, p.296), "the concept of a weekly cycle lost its significance, but the daily activities had a predictable rhythm, punctuated by events like watch changes, intervals, and meal times."

This segment will introduce and discuss literature that focuses on the safety and well-being of seafarers, especially considering the unique features of their work routines. It will delve into the occupational hazards and time-related aspects, including prolonged working

hours and additional duties. Key researches from Hansen et al. (2002) and Jensen et al. (2004) that probe into personal injuries linked with different phases of a seafarer's duty cycle will be spotlighted. Given the limited maritime-centric literature on the subject, references from the offshore oil industry will also be explored.

Lastly, the section will delve into issues relevant to the commencement and conclusion of a seafarer's service term in section 2.2.3. Topics such as the duration a seafarer spends journeying to a ship and the unpredictability concerning their departure from the ship and subsequent homecoming will be discussed. The section will wrap up with insights from Bailey et al.'s (2007) survey that scrutinized seafarers' risk perceptions at the start and close of

### 2.2.1 Time-Related Considerations

As discussed in section 1.1.2, seafarers often endure extended working hours during their service terms. Such prolonged working hours have been identified as risky in various professions, including construction (Lowery et al. 1998), healthcare (Gander et al. 2000), mining (Duchon and Smith 1994, cited in Dembe et al. 2005), firefighting (Lusa et al. 2002), bus driving (Meijman 1997), and long-distance trucking (Mccartt et al. 2000). Smith et al. (2006) unveiled that nearly half of the respondents from the offshore oil and support sector, and the short sea and coastal sector reported working over 85 hours weekly.

It's likely that these long hours are underrepresented due to the under-reporting practices to meet rest hour regulations, as alluded to in section 1.1.2. A study by Allen et al. (2006) discovered that 40% of seafarers surveyed admitted to under-reporting their work hours.

Extended hours and overtime can deteriorate performance, elevating error risks (Parkes 2007). Dembe et al. (2005, p.595) disclosed that in shore-based U.S jobs, overtime presented the highest injury risk, followed by schedules stretching over 12 hours daily or 60 hours weekly. While seafarers typically receive a fixed monthly wage, Ellis et al. (2012) found they worked, on average, more than ten hours daily in port and about nine and a half hours at sea, with 70% working daily onboard. This surpasses the average weekly work hours legally allowed in the UK, which is 48 hours (GOV 2017).

Although there's limited research connecting seafarers' accidents and time-on-duty, given their constant living and working onboard, seafarers are, in a sense, always "on duty." Nevertheless, other industry studies can provide insights. For instance, Pokorny et al. (1981)

found accident risk peaks during the third or fourth hour of a bus driver's shift, regardless of its start time. Other studies indicated elevated accident risks towards the end of extended shifts (Hanecke et al. 1998; Nachreiner et al. 2000; Dembe et al. 2005). Hamelin (1987) noted a considerable risk increase after 12 hours for French lorry drivers. Folkard (2000, p.22) surmised there's a consistent rise in accident risk as duty time progresses, with short-term spikes.

Interestingly, Folkard's (2000) remarks challenge prevailing fatigue and vigilance reduction theories. The risk seemed to decrease between the fourth and eighth hour. Four-hour shifts, common for seafarers, appeared to have a 20% higher relative risk than eight-hour shifts (Folkard 1997).

Further, studies depicted a rising risk with consecutive shifts. Folkard and Lombardi (2006, p.957) found injury risks escalating with each consecutive night shift in shore-based industries. However, most research emphasizes short spans of consecutive night shifts, making it challenging to determine risks across lengthier consecutive shifts. Folkard and Lombardi (2006) wondered about the risk patterns across extended consecutive night shifts.

Moreover, not just night shifts but consecutive morning/day shifts also show increasing accident risks with each subsequent shift (Folkard and Lombardi 2006, p.958). However, the exact relationship between a seafarer's successive shifts and injury risk remains under-researched, which will be further examined in the subsequent section.

### 2.2.2 Duration into Assignment

"Duration into assignment" pertains to the period from when an individual departs from home to commence work at a location, like a ship or an offshore setup, until they finish and head back home. In the offshore oil and gas sector, a study showed that injury severity correlates with duration into the assignment (Parkes and Swash 1999). This research categorized injuries as fatalities, severe injuries, and those causing an absence of over three days. For assignments longer than two weeks, the ratio of fatalities and severe injuries to the 3+ day injuries noticeably increased in comparison to one and two-week assignments.

Similarly, Parkes (2007) in a newer study within the same industry, found that as the two-week assignment for offshore workers progressed, injuries that required first aid treatment rose. Yet, severe injuries didn’t follow this trend.

However, while these findings are intriguing, the two-week assignments for offshore oil and gas workers are much shorter than the average assignments of seafarers. As noted in chapter 1.1.1, European seafarers typically work assignments ranging from three to six months, whereas non-European seafarers work between six to nine months (Oldenburg et al. 2009).

There's limited literature examining the frequency of incidents among seafarers in relation to duration into their assignment. Yet, in a study by Hansen et al. (2002), data was used to analyze the phase during which a seafarer had an accident. They found that the risk of an accident resulting in permanent disability diminished after a seafarer had been onboard for 90 days. However, before reaching the 90-day mark, the risk remained relatively stable.

Another study by Jensen et al. (2004) used questionnaires to calculate the accident rates among seafarers. The data collected included details about the seafarers' age, gender, work hours, ship type, role onboard, and length of the latest assignment. They discovered that seafarers onboard for less than 117 days had a higher accident rate compared to those onboard for over 117 days.

While both studies by Hansen et al. (2002) and Jensen et al. (2004) are insightful, neither provides specifics about the exact timing within the entire assignment when an injury occurred. Instead, they focus on the time leading up to an injury. These studies do not delve into the frequency of seafarer injuries in relation to the close of their assignments. Jensen et al. (2004) even remarked that their method of reporting might not be suitable for ships with other or permanent employment setups. The reason behind this statement wasn't elaborated upon. This gap in research is significant because both the start and end of a seafarer's assignment might have distinct factors influencing the possibility of occupational injuries.

| | Notified notifiable accidents not causing disability of 5% | | Accidents causing permanent disability of >5% | |
|---|---|---|---|---|
| Time aboard when accident took place (days): | Cases | Adjusted relative risk (95% CI)<br><br>(p<0.001) | Cases | Adjusted relative risk (95% CI)<br><br>(p<0.001) |
| 1–15 | 232 | 1.00 (reference category) | 42 | 1.00 (reference category) |
| 16–30 | 176 | 0.87 (0.71 to 1.05) | 22 | 0.60 (0.36 to 1.01) |
| 31–60 | 344 | 1.01 (0.85 to 1.19) | 51 | 0.85 (0.56 to 1.28) |
| 61–90 | 201 | 0.86 (0.71 to 1.04) | 30 | 0.75 (0.47 to 1.21) |
| >90 | 326 | 0.62 (0.52 to 0.75) | 43 | 0.51 (0.33 to 0.81) |

*Table 3. Time aboard when accident took place (adapted from Hansen et al. 2002, p.87)*

The literature discussed in this chapter reveals the profound effects work organization has on workers' health, safety, and overall well-being. The interplay between the occupational health, safety, and well-being of seafarers and their working conditions at sea is particularly intriguing. This is due to unique aspects of seafaring, such as the obligation to work daily for long durations, which set it apart from land-based jobs.

Additionally, various elements, like a seafarer's unfamiliarity with a ship, suggest that the start of an assignment could be especially hazardous in terms of both operational safety and personal well-being. Conversely, issues like accumulated fatigue hint that the assignment's conclusion might also be perilous. What stands out in the literature is the heightened interest in the beginning and conclusion of seafarers' assignments. This chapter also highlights how certain aspects linked to work organization and employment at sea, like the lack of specific workplace knowledge and extended work hours, can jeopardize seafarers' health and safety. Other elements, such as delays in returning home, touch upon issues of job autonomy and power dynamics, both on ships and within the broader seafaring job market. Yet, there's a noticeable gap in research addressing these concerns and their implications in the seafaring domain.

Thus, there's a distinct need to delve deeper into how work and employment structures at sea influence seafarers' well-being and safety experiences. This study aims to bridge this gap, employing a combination of methods including the examination of safety records from shipping firms and conducting structured interviews with seafarers. The upcoming chapter will provide a comprehensive look into these methodologies.

# Chapter III. Research Methods

The central aim of this thesis is to explore the health, safety, and well-being experiences of seafarers concerning their work and employment conditions at sea. The prior chapter illuminated that seafaring is notably risky, and the literature review pinpointed various work and employment aspects at sea that might influence seafarers' health and safety. These aspects encompass prolonged travel times to vessels with no rest breaks before starting a shift (refer to Wadsworth et al. 2008), and the ambiguity seafarers encounter about their return dates. It was also evident that seafarers perceive risks variably during their tours of duty (as seen in Bailey et al. 2007).

After disseminating information online regarding the study, the researcher received responses from a subset of individuals interested in participating. Out of those who showed interest, some individuals actively engaged and agreed to be a part of the research. The researcher then proceeded to pose the research questions to these participants remotely, leveraging digital communication tools to ensure a seamless interaction while maintaining the integrity of the study.

The preceding chapter also highlighted the relationship between injury severity and work organization, especially the duration into the tour, in the offshore oil and gas sector (as shown in Parkes and Swash 1999). The literature emphasized the significance of the number of consecutive days a seafarer spent onboard when an accident occurred (referencing Hansen et al. 2002 and Jensen et al. 2004). The review further noted the adverse effects of continuous shifts and extended hours – common in seafaring – on workers' safety in terrestrial occupations. This suggests potential links between work structures at sea and the health outcomes for seafarers.

To delve deeper into these aspects and address the research questions, a fitting methodological strategy was essential. This chapter delves into this strategy, outlining the research process and the reasoning behind the chosen methods.

This chapter is segmented into four primary parts. The first elaborates on the design of this study, explaining the acquisition of the injury data from seafarers, forming the quantitative aspect. It then touches upon the mixed-methods approach and the reasons for integrating both quantitative and qualitative techniques.

The second segment reflects on the pilot study's utilization and the insights gained from it. The third delves into the interview process with seafarers and provides a snapshot of the data

analysis procedure. The concluding section delves into the challenges related to research risks and ethics, discussing my stance as a researcher in practice and the associated implications.

## 3.1 Study Framework

Past research investigating the health, safety, and well-being of seafarers has employed a variety of methodologies, including questionnaires (e.g., Bailey et al. 2012), accident records from maritime bodies (e.g., Ellis et al. 2009), and interviews (e.g., Sampson et al. 2016). In the current research, a combination of qualitative and quantitative techniques, commonly referred to as a mixed methods approach, was adopted. The integration of these methodologies will be elaborated upon in section 3.3.2. The qualitative component involves semi-structured interviews with seafarers from different positions on four ships, which is explored further in section 3.3.

After disseminating information online regarding our study, we received responses from a subset of individuals interested in participating. Out of those who showed interest, the following individuals actively engaged and agreed to be a part of the research. We then proceeded to pose our research questions to these participants remotely, leveraging digital communication tools to ensure a seamless interaction while maintaining the integrity of the study.

### 3.1.1 Gathering Injury Data of Seafarers

Chapter two's literature review highlighted the limited and fragmented nature of injury-related data in the maritime sector, likely due to the complexities in data gathering arising from the global span of the industry. Mainly four data sources could be tapped into for insights into work organization and incidents of occupational injuries at sea: P and I clubs, national maritime boards, confidential report systems, and shipping companies. However, each of these sources has its own set of limitations.

For instance, P and I clubs typically document only major incidents (Ellis 2007), overlooking minor injuries or those that don't result in lost workdays. The absence of a uniform data format among these clubs makes data aggregation challenging. Furthermore, such data,

given its confidential nature, is not open to the public. Likewise, Philips and Dalty (2006) noted that national maritime authorities usually emphasize fatal accidents, hence omitting non-lethal incidents. While maritime authorities must register accident details due to SOLAS and MARPOL mandates, this information is often inaccessible to the public and occasionally poorly maintained (Ellis 2007).

Although confidential reporting systems capture varied severity incidents, their scope is limited, making them unsuitable for comprehensive maritime injury statistics (Ellis 2007). The ISM Code mandates all shipping firms to maintain accident records. These corporate records, due to their extensive details, are considered valuable, but their sensitivity prevents public access. These records often encompass detailed injury information and associated contexts.

A notable feature of this research is the acquisition of incident details directly from shipping companies. Additionally, deployment details, not present in the injury datasets, were sourced from the companies' HR departments. This allowed for a merger of injury data with HR data, offering insights into key elements like seafarers' onboard joining and expected departure dates. This combined data analysis facilitated a deeper understanding of seafarers' safety in relation to their work schedules at sea. The findings of this analysis are presented in chapter five. Obtaining access to this data proved to be intricate, and the challenges faced in doing so could shed light on the limited academic research in the seafaring sector, as indicated in the literature reviews of chapters one and two.

Ultimately, it was managed to secure data sets from three distinct shipping companies. The first set came from Company A, an international firm specializing in the operation and ownership of oil, chemical, and gas tankers. Company B, another global shipping enterprise owning and operating various offshore vessels primarily catering to the offshore oil and gas sector, provided the second set. The third dataset originated from a prominent container shipping enterprise, known as Company C.

| | |
|---|---|
| Vessel name | Root cause |
| Event date | Type of contact |
| Event description | Part of body injured |
| Type of incident | Nature of injury |
| Medical leave duration | Crew position |
| Immediate cause (unsafe condition) | Activity when injured |
| Immediate cause (unsafe acts) | Location |
| Underlying cause (job factors) | Age range |
| Underlying cause (human factors) | Nationality |
| Control actions area improvement | Company seniority |

*Table 4. Variables sent by Company A*

The initial outreach to Company A was through an email to their Human Resources department. This email was internally circulated to the crewing department, from where I received a response expressing their willingness to share the data I sought. The data, shared via Microsoft Excel sheets, were provided by a Health Safety Environment and Quality (HSEQ) Superintendent. This individual, based onshore, was tasked with overseeing the onboard seafaring workforce concerning health, safety, and environmental matters. Details such as the vessel's name, the date of the event, the date the seafarer joined the ship, and their anticipated departure date were then furnished by Company A's crewing department through email. Using the ship's name and incident date, it was feasible to integrate the data from HSEQ and the crewing department.

Company B's HSEQ department furnished the incident specifics and the relevant dates within a single Microsoft Excel sheet, which was similarly shared through email. The data elements contained in these spreadsheets will be elucidated in the ensuing table.

| | |
|---|---|
| Event date | Area of operation |
| IP signed on | Nature of injury |
| Severity (incident type) | Cause of injury |
| Activity | Rank |
| Part of body injured | |

*Table 5. Variables sent by Company B*

For Company B, given that all seafarers worked on five-week contracts, it was straightforward to determine the expected sign-off date for each seafarer.

Company C's data was exclusively sourced from an HSEQ superintendent. To obtain this data, the company required the completion of a research participant disclaimer. From Company C, only details regarding injury severity, the seafarer's join date, the incident date, and the seafarer's departure date were collected. The absence of the expected leave date meant that certain analyses, similar to those for Company A, couldn't be conducted, as will be detailed in section 5.2.

The researcher maintained ongoing communication with these shipping companies and was provided monthly data updates, detailing injuries occurring post the receipt of the initial dataset. These three companies, all European multi-nationals, have operations spanning globally. Walters and Bailey (2013, p.1) remark that European fleets often lead in ensuring worker protection. Hence, the data explored in this study likely represents the higher standards within the seafaring industry. Additionally, the openness of these companies in sharing safety records implies a level of transparency, suggesting their positioning towards the superior end of the industry spectrum.

Another way to gauge the standards upheld by these companies is by looking at the flags their vessels bear. Typically, companies with subpar standards gravitate towards flags from the Paris MoU's black list, as mentioned in chapter two. However, the fleets from these three firms operate under flags from both the Paris MoU's white and grey lists (Paris MoU 2017), hinting at their reputable standing within the industry. The fact that these vessels sail under varied flags is crucial, as studies (e.g., Psaraftis et al. 1998) have found links between the type of flag and accident rates.

Equally significant is the global operations of these companies. Past studies (e.g., Hansen et al. 2007) have often been geographically restricted. Moreover, the fleets consist of diverse vessel types including tankers, offshore support vessels, and container vessels. This diversity stands out as prior research (e.g., Philips and Daltry 2006; Lu and Tsai 2008) typically concentrated on a single vessel category. Hence, this study's examination of varied vessel types, with global operations and multiple flags, adds a layer of assurance to the dataset's comprehensiveness.

### 3.1.2 Integrative Research Approach

This research extended beyond seafarers' injury data to incorporate qualitative techniques, specifically semi-structured interviews with seafarers. This blend of methodologies designates the study as integrative research. Bryman (2008, p.1) describes integrative research as employing multiple data sources or methodologies to explore a research inquiry. The primary aim of this integrative design was to offer a more comprehensive perspective on how work and employment structures at sea influence seafarers' health, safety, and well-being than a single approach could achieve. Integrating qualitative and quantitative findings was insightful, as interview results influenced the shipping data analysis, a topic further explored

in chapter five. Interviews also delved into potential reasons for observed trends in the shipping data.

The research journey began by collecting initial datasets from three shipping companies, as outlined in section 3.1.1. This approach had certain limitations. Leveraging externally collected data necessitated a familiarization phase. Thankfully, the researcher could consult with the original data collectors for clarification. Furthermore, being reliant on Superintendents for data meant accepting what they chose to share. As discussed earlier, one key piece of data remained elusive from a Superintendent even though the shipping company possessed it. Concerns about data quality and other limitations will be expanded upon in chapter five.

However, the secondary analysis of shipping safety data had value. It showcased risks seafarers faced at different duty intervals, reinforcing discussions about work patterns and safety. The data also illuminated which variables were recorded (or omitted) post-incident. Next, a pilot study involving interviews with five seafarers was executed. This pilot's outcomes and implications are delved into in section 3.2.

Subsequently, the seafarers across four vessels were interviewed, detailed in section 3.3. This qualitative approach shed light on seafarers' perceptions and experiences concerning their work. The semi-structured format, as Bryman (2008, p.196) notes, offers flexibility, allowing for guided yet open-ended responses.

A comprehensive analysis of both safety records and interview insights followed. Steckler et al. (1992) argue for the mutual enhancement of qualitative and quantitative methods. This informed my approach, where qualitative insights shaped the injury data analysis. For instance, definitions of a duty's start and end, as outlined by seafarers, were vital for interpreting shipping data, discussed further in chapter five. Using both research methods addressed limitations inherent in singular method studies.

## 3.2 Preliminary Study

Before delving into the qualitative aspect, a preliminary study was undertaken. While qualitative pilots might be rarer than quantitative ones, they offer unique advantages. This section elucidates the rationale for a preliminary study, its benefits, execution strategy, and resultant learnings. It concludes by hinting at prospective themes for future exploration.

### 3.2.2 Insights Gained from the Preliminary Study

Undertaking a preliminary study chiefly aids in honing a research tool, like the interview guideline. Renowned scholars like Bryman (2008) have used preliminary studies expressly to enhance these tools. Other researchers, like Turner (2010), have formulated questions drawing from insights garnered during these preliminary runs. Moreover, Bryman (2008) mentions that such a study provides a chance to get acquainted with tools like audio recorders, which I hadn't used previously.

The primary incentive behind my preliminary study was to validate and improve my interview guideline before boarding a ship – my main avenue for accessing seafarers, as described in section 3.3. Considering the intricacies involved in accessing ships for research due to both logistical and official reasons, a preliminary test of the guideline was deemed necessary.

Examining my interview guideline also gave me insights into potential improvements in garnering responses. It highlighted parts that lacked fluidity or sections where eliciting detailed answers proved challenging. For instance, inquiries regarding seafarers' injuries at sea were especially tricky. The initial replies often claimed no injury experiences. Yet, allowing a brief pause led participants to recall and share such incidents.

The researcher was also able to pinpoint issues during interviews; however, the clarity became more pronounced during transcription and subsequent reflection.

Another pivotal realization that emerged early in the preliminary study was an alternative approach to exploring the quantitative data the researcher had. Instead of the logical chronological examination, comments from two officers suggested varying work patterns and intensity towards the tour's end. This indicated the importance of analyzing the data starting from the tour's end, moving backwards, rather than the typical forward chronological approach.

Therefore, this preliminary study bestowed several insightful lessons, enhancing my research methodology.

## 3.3 Engaging with Seafarers

Following the improvements to the researcher's interview guideline, the researcher embarked on interviewing seafarers. However, accessing them required strategic planning. Some researchers, like Sampson et al. 2016, have approached seafarers through shore-based maritime training hubs. This method, however, might have limited my sample in terms of rank

and nationality. Using seafaring centers in ports was another considered avenue, but after initial assessments, it was determined that they weren't popular.

After disseminating information online regarding the study, the researcher received responses from a subset of individuals interested in participating. Out of those who showed interest, some individuals actively engaged and agreed to be a part of the research. The researcher then proceeded to pose the research questions to these participants remotely, leveraging digital communication tools to ensure a seamless interaction while maintaining the integrity of the study.

As a result, the researcher chose to conduct interviews directly on ships. Prior studies by Bhattacharya (2009) and Sampson (2013) also took this route, allowing access to a diverse group of seafarers in a familiar environment. While staying onboard during voyages would have offered more time, personal constraints led me to interview during port stays. Though this limited my interaction time, my past maritime experience was instrumental in establishing a quick rapport. This aspect is elaborated in section 3.4.1.

It's crucial to note the distinction between interviewing multiple seafarers on the same ship versus individuals on different vessels. There's an inherent bias in the former as seafarers might discuss similar recent events. To mitigate this, the researcher urged seafarers to delve into broader experiences, encompassing different ships.

This segment delves deeper into the specifics of the interviews the researcher conducted and the subsequent analysis of the qualitative data gathered.

### 3.3.1 Interviewing Onboard Vessels

The researcher visited a total of four ships, each located in different ports. Every ship was visited throughout its entire stay in port, which lasted about two days for each. To gain access to the ships, the researcher obtained consent from the Captain, whom they reached out to via email. A local ships' agent aided this communication. This agent, responsible for assisting ships while they're in port, informed the researcher about the ships that were set to arrive. Using such a gatekeeper was pivotal, as previous studies have shown that accessing seafarers can be challenging. For instance, Bhattacharya (2009, p.95) detailed the complications of reaching seafarers due to logistical and procedural challenges. Thanks to the agent's assistance, these challenges were efficiently addressed, and the researcher didn't face any rejections from the Captains approached.

In the initial email to the Captains, the researcher introduced themselves, outlined the research's purpose, and detailed the proposed activities onboard. On one ship, it was revealed that this information had been disseminated among other crew members, as evidenced by the Chief Engineer who had verified the researcher's credentials online prior to the visit. Interestingly, two Captains expressed gratitude for being directly approached for consent, rather than having the shipping company grant access without their input. One seafarer even indicated a willingness to participate, believing the researcher wasn't tied to the shipping company. However, a limitation of this direct approach was that the researcher's permission was exclusive to that specific ship, making them vulnerable to last-minute schedule adjustments. To counter this, the researcher diligently tracked ship schedules by communicating with the agent and observing the vessel's Automatic Identification System (AIS) online.

Upon arrival at the ship, the researcher first met with the Captain to share necessary information. On ships 3 and 4, the Captain introduced the researcher to other crew members. In contrast, on ships 1 and 2, a junior officer was designated to assist the researcher.

The researcher conducted a total of thirty-seven interviews, with each averaging around fifty-three minutes. The number of interviewees varied between ships, but the researcher ensured diverse representation, speaking with senior officers, junior officers, and ratings. The table below provides a summary of the interviews, detailing the count of officers and ratings from each ship. A notable observation was that all ships had crew members from at least three different nationalities, indicating they were multi-national crews.

| | **Officers interviewed** | **Ratings interviewed** | **Total seafarers interviewed** | **Officers onboard** | **Ratings onboard** | **Total seafarers onboard** |
|---|---|---|---|---|---|---|
| **Ship 1** | 3 | 7 | 10 | Unknown | Unknown | 23 |
| **Ship 2** | 10 | 2 | 12 | 12 | 9 | 21 |
| **Ship 3** | 5 | 2 | 7 | 6 | 4 | 10 |
| **Ship 4** | 6 | 2 | 8 | 6 | 4 | 10 |
| **Total** | 24 | 13 | 37 | | | |

*Table 6. Summary of the interviews*

### 3.3.2 Analysis of the Interview Data

The researcher recorded all interviews with a digital tape recorder. While onboard, the researcher made concise field notes regarding observations, and post each ship visit, transcribed the interviews and documented these notes. The researcher utilized the CAQDAS program NVivo for analysis, importing the transcriptions and field notes into the program.

The researcher started the analysis by reviewing all the transcripts, making preliminary notes on striking observations. Upon a second read, they began assigning codes to topics emerging from these transcripts. Some topics were summarized in a few words, while others were expanded on extensively.

After this, the researcher reassessed the codes in correlation with the transcripts. When similar phenomena were described differently, they standardized the wording to ensure consistent coding. They also began identifying connections between codes, noting, for instance, if specific ideas were predominant among seafarers of certain ranks or employment types. They subsequently grouped these codes into categories based on shared characteristics, aiming to streamline data and align it to the research question. These categories then informed the themes discussed in the findings chapters.

## 3.4 Further Considerations

This section highlights primary considerations the researcher was mindful of during data collection and throughout the research. These encompass the researcher's role, ethical principles in social research, and research-related risks.

Recognizing one's role in research is crucial. As Malterud (2001, p. 483-484) notes, a researcher's background influences their research approach, methods, findings, and conclusions. The researcher's background undoubtedly shaped this study, making it essential to recognize potential biases and take measures against them.

Ethical principles in social research primarily focus on participants' harm, informed consent, deception, and privacy invasion. The researcher's steps to uphold these ethics, like giving participants a detailed study overview and acquiring written consent, are elaborated in section 3.4.2.

Section 3.4.2 also details measures taken to minimize risks to both the researcher and participating seafarers. As Bloor et al. (2010, p.45) emphasize, qualitative research often presents inherent risks due to prolonged personal interactions in uncontrolled settings. The

researcher faced challenges like working solo in a potentially hazardous environment and broaching sensitive subjects with participants, like personal injuries.

### 3.4.1 Ethical Considerations and Risk Management in Research

During the study, the researcher constantly remained conscious of potential risks to both themselves and the study's participants. To mitigate these risks, especially while working solo, they took several precautions. For instance, they donned the required personal protective gear as stipulated by the port and the vessel during their research. They diligently adhered to the guidelines and instructions set by the port personnel and the ship's crew.

Before venturing to the research sites, they left their travel plan details with a designated contact. After each research site visit, they updated this contact about their safety and progress. Additionally, both the ship's agent and port security were informed of the researcher's whereabouts, and they were also updated once the research on-site was concluded. The researcher was fully aware that their research could have implications for the participants, understanding that they might have both professional and personal interests to safeguard.

The research methods employed adhered to the standards set by the British Sociological Association's Statement of Ethical Practice (BSA 1992). Before initiating the interviews, all participants were informed of their rights, including the right to terminate the interview. Each was provided an informational documents as well as a form, that clearly states participants' rights, ensuring data anonymity and confidentiality.

The researcher was fully aware of the irony of querying seafarers about their job perceptions and experiences related to their well-being during their busy port stays. They took into account the possible infringements of rest hours regulations and ensured no interviews were conducted if they would cause such violations.

Data confidentiality was a priority. All names were anonymized, and in the data analysis, only the participant's rank and the ship's identifier (e.g., ships 1, 2, 3, 4) were retained. Since insiders might recognize pseudonyms or other specifics, the researcher sometimes needed to generalize certain details for anonymity.

All collected data were stored securely. Electronic files were safeguarded on a password-protected computer. Furthermore, the data will be securely stored for five years post-research.

## 3.5 Recap

This segment has detailed the research methodologies employed in this study, designed to comprehensively answer the study's research questions. The methods included the utilization of safety data from shipping firms to delve into seafarers' safety concerning work patterns. The value of using semi-structured interviews to gain seafarers' perspectives on the impact of work organization at sea on their health and safety was also highlighted. This chapter revealed how a mixed methods approach was used to answer the central research question about seafarers' experiences in relation to their employment at sea.

It further discussed the rationale for the pilot study and the learnings derived from it, such as the importance of pauses to allow comprehensive answers from respondents. This segment also shed light on the ethical aspects considered during this research, and the researcher's unique standpoint. Their role as an insider researcher was highlighted, emphasizing the significance of this awareness in ensuring that the data gathering and its subsequent analysis were carried out with integrity.

The subsequent chapters will discuss the results from the safety data of the shipping companies and the insights derived from the qualitative data. Before delving into that, the next chapter will present findings from the interviews, offering a glimpse into a seafarer's work tenure.

# Chapter IV. Insights Into A Seafarer's Typical Tour Of Duty

This section, being the initial one out of three exploratory chapters, endeavors to offer a glimpse into the life of a seafarer. Specifically, it sheds light on the structuring of their daily tasks and their employment conditions. Insights from the seafarers on their work organization and employment modes are shared. This chapter is structured around various themes identified from interviews with seafarers recounting their personal sea-life experiences. Both this section and chapter six predominantly utilize interview transcriptions and observational notes from the four vessels visited.

The early portion of this chapter delves into aspects concerning the employment of seafarers. The first chapter highlighted the prevalence of unstable employment within the maritime sector, with a significant majority of seafarers, though not all, being hired for individual voyages. Such employment practices, found in various sectors, have been linked to detrimental outcomes in health, safety, and overall well-being. This chapter hence juxtaposes experiences and viewpoints of those with permanent jobs against those on unstable contracts.

The latter part of this section brings forth the seafarers' accounts of their typical onboard routines. This includes the operational workings onboard, where a limited crew manages the ship round the clock, every day. It further touches upon their rest periods, presenting insights into fatigue-related issues and the seafarers' understanding of risks associated with exhaustion. Such challenges might be omnipresent throughout their duty term, starting from their first day onboard to their return journey home.

This chapter's narratives aid in framing and giving context to the findings showcased in chapter six, which focuses on specific intervals during a duty cycle. Furthermore, to grasp the impact of maritime work and employment structure on seafarers' health, safety, and well-being, it's crucial to look beyond the specific durations highlighted by existing literature and the participants, and to understand the holistic experience of a typical duty tour.

## 4.1 Understanding Seafarer Employment

Studies in land-based industries have unveiled connections between occupational health, safety, well-being, and employment practices. For instance, Quinlan et al. (2001) identified unstable employment as contributing to worsening worker safety and health, increasing injury rates and disease risk. Literature also underscores employment instability as a significant concern in relation to well-being outcomes.

The maritime sector exhibits several features tied to job organization and employment, known to correlate with poor occupational health and safety outcomes seen in land-based sectors. Therefore, it's conceivable that seafarers could face similar negative outcomes.

### 4.1.1 Consistent Employment

Research has shown considerable variation in the employment experiences of seafarers, contingent upon multiple factors. Other studies have found the duration one spends at sea to be consistent for some and sporadic for others, depending on their employment type.

In the sub-section 1.1.1, it was observed that seafarers from economically advanced nations typically enjoy stable employment conditions, irrespective of their rank. This leads to predetermined sea and home durations. During both these periods, they receive a monthly wage. The study supports this notion, with one rating from an advanced country elucidating his employment terms:

"I've had a permanent contract since 2007; working 5 weeks on and 5 weeks off" - Chief Cook from Ship 1.

Seafarers with permanent jobs don't face the same financial uncertainties as their temporarily employed peers. This distinction has profound implications for their health, safety, and well-being, which becomes clearer as this section unfolds.

Some permanently employed seafarers have arrangements where two individuals share a role, rotating between sea and home. Throughout the interviews, the term 'back-to-back' frequently emerged, signifying a recurring cycle between two specific seafarers for a particular position on a ship. However, it appeared that this scheduling method was mainly enjoyed by senior officers from economically advanced nations. In contrast, their counterparts from developing countries often found themselves on single-voyage contracts. For instance, on one ship, while the Captain and Chief Engineer (both Europeans) operated on 'back-to-back'

schedules, the Chief Officer and Second Engineer, both from developing countries, were on individual trip contracts.

Seafarers benefiting from the 'back-to-back' arrangement often coordinated their schedules amongst themselves, rather than having the shipping company dictate terms. One Second Engineer shared:

"We coordinate amongst ourselves. If I want to come in a week early or later, it's between me and my counterpart. There are some general guidelines, of course, but we largely have autonomy over our schedules" - Second Engineer from Ship 2.

Such flexibility, allowing seafarers to decide their onboard tenure, is significant, especially when considering the start and end of a duty cycle.

This flexibility, however, demands mutual agreement between the two seafarers. If they can't reach a consensus, the shipping firm decides the rotation. Yet, in such scenarios, it's not rare for a seafarer to request a transfer to another vessel.

Studies, like that by Lewchuk et al. (2003), emphasize the importance of scheduling certainty to an individual's job satisfaction. Traditional metrics of job satisfaction indicate that workers feel better when they believe they have more control over their jobs. Thus, it can be inferred that seafarers with greater autonomy over their schedules might feel more content.

Given these perspectives, it's understandable that many seafarers prefer the 'back-to-back' scheduling, offering them considerable control over when they embark or disembark a ship. This arrangement becomes even more coveted when considering factors like advance notice before joining a ship or the possibility of mandatory duty extensions.

The flexibility intrinsic to the 'back-to-back' structure partially relies on both seafarers' willingness to agree on a mutual understanding. If they can't, the company determines the rotation schedule. Under such conditions, it's common for one seafarer to request a transfer to another vessel.

Scholars like Lewchuk et al. (2003) posit that scheduling certainty—how much control one has over their work timings—is a key component of job satisfaction. Classic studies, such as the one by Karasek (1979), suggest that workers are more content when they perceive they have more job control. Hence, it can be assumed that seafarers with more scheduling autonomy might experience enhanced well-being.

It's thus no surprise that seafarers' narratives indicate a strong preference for 'back-to-back' schedules, granting them a substantial degree of scheduling autonomy. Such arrangements are highly sought after. For instance, on Ship 2, charter terms mandated officers

of a specific nationality. Due to a shortage of junior officers of this nationality in the company, many officers found themselves on 'back-to-back' schedules. As explained by the Fourth Engineer:

"Currently, I'm on a 3-month-on, 3-month-off schedule. It's more about how things worked out on this ship. Typically, with the British crew requirement, it's easier to have two individuals rotating back-to-back" - Fourth Engineer from Ship 2.

Evidently, the Fourth Engineer appreciated this scheduling, a luxury he might not have enjoyed until attaining a higher rank.

Seafarers on 'back-to-back' rotations reported staying connected with their counterparts while ashore, either via email or social media. “This time, for instance, he had reached out to his opposite via email. However, due to the unfortunate passing of his opposite's father-in-law, the latter was unable to make it. As a result, he decided to extend his stay by an additional 10 days," remarked the Chief Engineer of ship 2.

Subsequently, this control they maintain has favorable effects on the well-being of seafarers.

### 4.1.2 Flexible Employment

Contrastingly, seafarers, especially those from economically challenged countries like the Philippines, experience diminished autonomy and heightened job unpredictability. These individuals frequently find themselves in unstable employment situations, often working through intermediary crewing firms. This supports Ellis et al.’s 2012 findings, which linked the nature of seafarer employment to their national origin.

These agencies employ seafarers for specific voyages, compensating them only during their sea tenure. Once they return, while many aim to secure another voyage contract, it's not always guaranteed. An AB detailed his experience of frequently switching between various ship types and companies, all managed by the same agency in Manila.

Another AB shared his varied experience of serving on different vessels within the same shipping company during each duty tour. However, this isn’t exclusive to those in unstable employment. Even those on permanent contracts sometimes switch ships for each duty period. This variability can pose safety concerns. Research has shown that workplace familiarity can reduce injury risk. In the seafaring context, Hansen et al. (2002) discovered that returning seafarers faced fewer injury risks.

Even with these safety concerns, the industry views seafarers as versatile workers, capable of adapting to varied roles. This versatility is supported by the STCW, which offers a universally recognized qualification, enabling seafarers to work on any vessel. This adaptability was evident from the diverse experience of a British AB who had worked across multiple sectors within the industry.

However, not all seafarers view this flexibility positively. Some view these shifts as economic necessities rather than personal choices, especially those from less prosperous nations. Based on Lewchuk et al.'s model, this lack of autonomy concerning deployment can be detrimental to well-being.

Moreover, unfamiliarity with specific ship types can pose operational and safety risks, not just for the seafarer but also for fellow crew members. For instance, an AB from the offshore sector found himself out of depth on a tanker, necessitating alterations in work routines to manage the risks.

Unsurprisingly, accounts from seafarers indicated that familiarity with a particular vessel was always preferred. Those with such experience were viewed as lesser risks. One Captain emphasized the importance of retaining experienced crew, citing the safety record of his vessel, which hadn't recorded a serious accident in over a decade. However, the introduction of new members can elevate risks, as noted by the same Captain.

This constant shuffling also has implications for establishing camaraderie among crew members, which will be elaborated upon in chapter 6.1.2.

### 4.1.3 Tour of Duty Duration

Regardless of their knowledge of a ship, the seafarers they spoke to had different tour of duty lengths, which varied from five weeks to six months. Various factors influenced these durations. The length of these tours depended on the type of employment, rank, and qualifications of the seafarers on all the mentioned ships. On the same ship, some had tours as short as six weeks while others lasted up to six months. Senior officers usually had the shortest durations, while the ratings had the longest.

Distinct variations in these durations were especially noticeable on ships with busy trading schedules. From the accounts of seafarers, ships with tight schedules were less preferred. This made it challenging for shipping companies to hire and keep senior officers for

such demanding vessels. As a result, senior officers on these busy ships had more influence over their tour durations than their counterparts on less busy ships.

On one of the busy ships they discussed, senior officers had contracts specifying two-month tours, similar to their peers on other vessels. However, in reality, they were only on board for six-week tours. When inquired if the shipping company had any reservations about these shorter unofficial tours, one Chief Engineer remarked that the company had little choice in the matter. This suggested that senior officers on such vessels had more control and flexibility over their durations compared to their peers on less demanding ships or those of lower ranks on the same ship.

Junior officers and ratings on these demanding ships lacked such control. This was because they weren't on a back-to-back schedule and were more easily replaceable by the shipping company.

There were also noticeable differences in tour durations among seafarers of different nationalities with similar qualifications and roles. A Swedish Second Officer mentioned differences in the lengths of contracts between himself and a Polish and Croatian Second Officer. This supports previous findings by Oldenburg et al. (2009) which showcased differences in average tour durations based on nationality.

Interestingly, even when working closely together, some officers were not entirely aware of the exact durations of their peers. But it was evident that there were attempts to negotiate shorter tours, especially from those who learned of colleagues with shorter durations. However, these negotiations were not always successful, often due to financial considerations.

Such disparities in tour durations were a sensitive topic. Seafarers with shorter tours were cautious about discussing it, especially in front of those with longer tours. Even during interviews, this subject was approached delicately. For instance, one Third Engineer expressed frustration over the difference in duration between himself and his Danish counterparts.

n daily interactions, discussions were often centered on how much time each seafarer had left onboard rather than their entire contract duration. This was to avoid conflicts and to focus on the anticipated end of their current tour.

However, these anticipated durations weren't always accurate. As explained in a previous chapter, some contracts allowed shipping companies to send seafarers home earlier than scheduled or even extend their tours mandatorily. These mandatory extensions are a major concern and will be discussed further in an upcoming chapter.

## 4.2 The Seafarer's Existence

The extended durations away from home characterize the unique life of a seafarer. Thomas and Bailey (2009) portray the seafarer's existence as divided. This stems from the fact that seafarers oscillate between two contrasting worlds: their life at sea and their life at home. While they aren't typically engaged in paid activities when at home, their time at sea encapsulates them within their work environment. Except for the occasional short leaves during port stops, their time is majorly spent onboard. This nature of work is distinct from conventional occupations.

The maritime occupation poses unique challenges which hint at the potential psychosocial issues. Carter (2005, p.61) believes there are numerous factors at sea which can challenge one's coping mechanisms. Given that a lot of responsibilities onboard are pivotal to safety, any dip in performance can jeopardize maritime safety.

### 4.2.1 Crews of Mixed Nationalities

Seafarers not only work but also live on ships, sharing their space with colleagues. This kind of coexistence is not common for workers in land-based sectors. The number of crew members on a ship can vary. In the context of the discussed vessels, including an offshore pipe layer and three tankers, crew size ranged from ten to twenty-three. These figures align with industry averages, with a typical crew size being fifteen (Bergantino and Marlow 1998).

Each ship housed crew members from multiple nationalities, speaking different languages and hailing from varied cultural backgrounds. English was the standard operational language for the vessels in discussion. Yet, it's noteworthy that on two ships, there were no native English speakers, a scenario not out of the ordinary.

Every ship boasted crews of at least three different nationalities, classifying them as multi-national crews. Some literature suggests that seafarers might prefer working on such diverse crews (Sampson and Zhao 2003) because it's believed that varied nationalities bring about greater mutual respect. On the other hand, studies like Oldenburg et al. (2009) highlight that not all, especially non-Europeans, are fans of multi-cultural crews.

An observation from one of the discussed vessels, with a primarily British crew, showed skepticism towards members of other nationalities, especially concerning alleged theft of food. This aligns with the notion that not every seafarer is in favor of multi-national crews.

Furthermore, multi-national crewing might inadvertently lead to social isolation. When crew members converse in their native languages, it can alienate those unfamiliar with it. Such isolation can be detrimental to a seafarer's well-being (Sampson and Thomas 2002). Another potential complication arises from divisions within crews based on nationality, sometimes overriding occupational ranks. For instance, in one ship, seating arrangements during meals defied the occupational hierarchy due to shared nationalities and linguistic preferences.

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Such deviations in norms might also be influenced by employment terms. An observation from Sampson's (2013) study highlighted a similar pattern, where officers of a particular nationality were isolated both from their junior counterparts and from officers of other nationalities. This kind of social isolation can have negative implications on the well-being of seafarers.

### 4.2.2 Time Coordination Onboard

A lack of consistent time coordination on ships can intensify the feelings of isolation for seafarers. This is due to shifting work teams, as will be further discussed in chapter 6.1.2. The ships in question had a mix of crew members: some were newcomers, others were nearing the end of their duty period, and some were in between. With varying duty durations, seafarers often found themselves embarking or disembarking at different times.

For tankers, maintaining a gap in time coordination, especially among officers, is a SIRE8 stipulation. SIRE dictates that the Captain and Chief Officer, as well as the Chief Engineer and Second Engineer, should not depart the ship within a two-week span of each other. Past incidents, such as the Piper Alpha disaster mentioned in the Cullen (1993) report, underline the safety concerns arising from information gaps during worker transition. Although SIRE's two-week overlap rule aims to mitigate this, some seafarers see it as redundant. For instance, one Second Engineer commented on how they often bypassed the overlap rule, much to the dismay of the shipping company.

However, some seafarers acknowledged the potential safety merits of such gaps in time coordination. One Bosun pointed out that the staggered crew changes mean that newcomers, less familiar with procedures, can be guided by more tenured colleagues.

This lack of time coordination led many seafarers to create personal timelines, noting important dates like their anticipated departure. Traditional land-based time markers seemed

irrelevant at sea, prompting seafarers to develop unique methods of tracking time, such as counting the number of remaining ports, as shared by one Deck Cadet.

Another dimension to this topic concerns daily work hours. The continuous operation at sea required seafarers to work in split shifts, alternating between day and night. This pattern could mean that some were resting while others worked. However, those off-duty might be called upon unexpectedly. The constant presence in the workplace meant seafarers were always seen as available, even during planned rest times. This disrupted schedule made some seafarers more reliant on their colleagues to uphold safety and operational standards. A Bosun's statement suggests that those roused from rest might not be as safety-focused as their on-duty counterparts, highlighting a connection between sea work schedules and safety.

## 4.3 Shipboard Life Routines

Lamvik (2002) posited that time on the sea is characterized by both a linear and circular nature. It's linear because a ship is always moving, and its crew looks forward to the immediate future. Meanwhile, the circular aspect is evident in the recurring daily activities on the ship.

The observations revealed that life on the ship has certain consistent rhythms. Events such as the shift changes and meal times take place predictably every day. In this environment, seafarers usually engage in repetitive tasks all week long, making the traditional weekly cycles of land life blur into insignificance. As one First Officer described it:

“It's the same routine every day. Meals are at the same time, and daily activities start in the same way,” remarked the First Officer from ship 1.

However, there were also inconsistencies in these routines. For instance, a mentioned ship didn't dock immediately upon reaching a port. Instead, it would drift9. When the terminal was ready for the ship, the Captain received only an hour's notice to get the vessel prepared. During this period, getting the ship ready became the top priority. As a result, seafarers would work regardless of their planned schedules, indicating that their daily routines could be disrupted by external factors like terminal demands.

### 4.3.1 Employment Schedules at Sea

Chapter one's Table 2 provides a snapshot of the work patterns and hours allocated to each crew member on board. Among the vessels discussed, seafarers on the three tankers had

hours resembling those in Table 2, whereas those on the offshore vessel clocked in for a 12-hour shift every day.

Table 2 denotes that engineers on the three tankers operated from 0800 to 1700. Post these hours, the engine room was designated as an unattended machinery space (UMS), a recent change enabled by technological advancements. This advancement allows machinery spaces to be remotely monitored. However, when unattended, an engineering officer, who rotated nightly, was on-call to address any alarms. For ships with a three-tier engineering team (Chief, Second, and Third Engineers), this meant that besides their daily duties, each one had an on-call night once every three days.

While the engineering team had rotating extended hours, the deck team logged extra hours during port stops, as shown in Table 2. This table doesn't capture the unpredictable additional hours they might work, such as during emergency drills typically held in early afternoons. For instance, seafarers with a shift from 0400-0800 would be disrupted from rest to participate.

The timing of such drills could even conflict with a ship's trading pattern. One cited vessel had an emergency drill after a late-night berthing the previous evening, requiring participation from many who had compromised their sleep.

It was noted that seafarers' jobs involved repetitive tasks, intermittently interrupted by high-intensity group tasks. For instance, a Second Officer might spend weeks on end watchkeeping (a solitary task) only to switch to the high-intensity task of assisting in vessel mooring on reaching port.

Some ship functions, like port arrivals, don't allow individual routine adjustments. In contrast, despite a strict routine, some officers have flexibility outside their core duties. For example, a Third Officer, with watchkeeping from 0800-1200 and 2000-0000, might have additional tasks to perform outside these slots. One Third Officer from ship 2 remarked on this flexibility, suggesting that non-watchkeeping hours aren't always fixed.

The autonomy over work hours varied with rank. Lower-ranking seafarers reported that senior officers dictated their schedule. Their tasks, often influenced by the ship's needs and weather, didn't always align with their preferences. In contrast, those in managerial roles had more discretion over their schedules. A Chief Cook from ship 1 mentioned the variability in his routine, while a Chief Engineer from ship 4 candidly admitted to occasionally taking breaks despite logged working hours. Similarly, a Captain from ship 4 noted the ability to reschedule tasks if he wished to take some time off the ship.

From their observations, it's clear that senior officers had the capability to exercise authority over their work schedules, tailoring them to their preferences. Moreover, they had the ability to dictate the schedules of lower-ranking crew members. Such a dynamic was largely due to an absence of direct management oversight from land. Similarly, Sampson (2013, p.88) indicated that actions on a ship often go unnoticed by land-based management, allowing a ship's Captain significant discretion over the workload of individual crew members and the entire team.

This absence of land-side oversight led to inconsistencies in shipboard work routines. When a new senior officer came on board, the routines of certain crew members could shift. A Deck Cadet from ship 2 shared an instance:

"It changes with the chief mate. With the previous one, we worked the entire day on Saturday, but had half or usually a full day off on Sunday. However, with this new Chief Officer, it's half a day on Saturday and possibly the full day on Sunday, but I usually get at least one day off."

Such alterations can be disorienting, yet they were not uncommon. Still, there were senior officers like the Chief Engineer on ship 2 who used their authority to offer flexibility in line with the preferences of the crew:

“Starting work at 7 in the morning can be early, but the crew prefers it to finish by 4. I've had some start at 8 and end at 5. I'm flexible either way, based on their preference.” says the Chief Engineer of ship 2.

However, not every senior officer was this accommodating. Some misused their power, leading to additional workloads for others. A Third Officer from ship 2 recalled:

“In my time with [company name], I consistently worked extended shifts because of a lazy Chief Officer.”

The Third Officer's comment hints that, rather than the typical 4 hours on/8 hours off routine, he was instructed to work 6 hours on/6 hours off – essentially covering the Chief Officer's hours. Such behaviors could foster resentment on board, with limited recourse for junior officers unless such conditions violated rest hour regulations. The situation with this Chief Officer raises questions about the potential actions seafarers could take if it were a Captain misusing authority. Sampson's (2013) ethnography reveals a Captain characterized as a bully, who exerted power detrimentally.

Given such dynamics, it's not surprising that the crew's perceptions of job control were tied to their sense of well-being. Seafarers who felt they had some control over their work schedules reported better well-being outcomes. This relates back to Karasek's (1979) job demand control model, as discussed in section 4.1.1.

It's crucial to remember that for seafarers, the ship is not just a workplace, but also a living space. Thus, the authority held by senior officers impacts not only work schedules but also personal downtime, intensifying the importance of job control compared to land-based jobs.

### 4.3.2 Rest Hours and Fatigue in Seafarers

In section 1.1.2, it was discussed how the seafaring sector, unlike many others, sets regulations on the minimum rest hours for a seafarer, rather than the maximum working hours. Onboard a vessel, it's the Captain's duty to ensure that rest hour regulations, as per MLC (2006), are maintained. A Captain from ship 2 shared a recent incident where he had felt significant fatigue due to time pressures during dry-docking. He had exercised his authority to delay the ship's departure because the engineering team was overly exhausted. This decision was supported by the shipping company, affirming a Captain's significant role in overseeing rest hours. Another Captain from ship 4 similarly mentioned how they had delayed departures to ensure the crew was adequately rested.

These insights highlight that a Captain does have the autonomy to delay events for the sake of crew rest, and often, such decisions receive support from shipping companies and terminal operators. This support might make Captains more inclined to make such decisions. Yet, it's worth noting that not all Captains across every ship may receive this kind of backing. Sampson's (2013) research pointed out that Captains often face pressure to stick to tight schedules and only infrequently push back.

Interestingly, the examples provided indicate that decisions to delay a ship's departure or arrival are primarily due to the crew's exhaustion rather than the Captains' own fatigue. But, it's a rare occurrence to postpone a vessel. Many seafarers believe the current rest hour rules don't allow for enough recovery. A Captain from ship 4 expressed how there are times when they are too tired but still need to work. Similarly, a Deck Cadet from ship 2 mentioned the fatigue that comes from working in shifts of six hours on/six hours off for extended periods.

According to a Third Officer from ship 2, working in such six-hour shifts is very demanding. This sentiment echoes research by Smith et al. (2006), which linked this two-man watch system to negative health and safety results. Bloor (2003) also pointed out the inadequacy of the current rest hour regulations.

A concerning trend is the frequent non-compliance with these regulations. Many seafarers, like a Second Officer from ship 4, admit to breaching these rules. Often, these violations aren't even documented. For instance, a Chief Engineer from ship 4 spoke of minor adjustments to rest hour records to avoid penalties. Another alarming account was of a Third Officer from ship 2, who found his rest hour records altered to hide non-compliance. Such manipulations suggest that seafarers might prioritize avoiding unwanted attention over adhering to regulations.

However, certain events, such as arrivals, departures, and bunkering, have fixed logged times which inspectors verify. In such scenarios, seafarers can't easily adjust the records. The Chief Engineer from ship 4 acknowledged that they would only accurately record non-compliances when they couldn't find a way around it. These revelations imply a need for better oversight to safeguard seafarers' health and well-being.

The Maritime Accident Investigation Branch (MAIB) has even stated that rest hour records on many ships, which generally indicate compliance, aren't entirely trustworthy. Such under-reporting is worrying since studies, like that of Smith et al. (2006), link it to higher fatigue levels among seafarers.

In the interviews, it became evident that seafarers felt more fatigued at the start and end of their duty tours. However, factors like weather conditions and the ship's schedule also played significant roles in their exhaustion levels. A Chief Engineer from ship 4 pointed out the challenges of winter, with rough seas making sleep difficult. Fatigue is more than just a discomfort; it's a safety risk. Both a Second Engineer from ship 2 and a Fourth Engineer from ship 2 linked exhaustion to lapses in safety protocols and increased chances of injuries. Captains and research both validate these concerns, emphasizing the need to address fatigue for the safety and health of seafarers.

## Chapter V. Data from Maritime Companies

The preceding chapter utilized interviews to delve into the experiences of seafarers concerning their health, safety, and well-being in the context of their work organization and employment throughout a standard tour of duty. It highlighted how employment terms differ among seafarers and the implications of their familiarity with their workplace environment. Through this qualitative approach, insights were gleaned about seafarers' perceptions of authority and autonomy. By juxtaposing the testimonies of these seafarers with occupational safety studies from land-based industries, it's inferred that those navigating the seas might be more susceptible to harmful safety results during specific times in their duty cycle, particularly when they're unfamiliar with their environment. Shore-based research, such as that by Underhill (2007), identified a heightened risk of injuries among temporary workers at the beginning of their tenure due to unfamiliarity. Given that many seafarers often switch between vessels or even within the maritime industry's sectors, they could face higher injury risks early in their tour of duty.

However, contrasting findings exist. As noted in chapter two, Parker's 2007 study of the offshore petroleum sector pointed to an uptick in minor injuries as a two-week duty tour went on. Similarly, Folkard and Lombardi's 2006 research indicated a growing risk of injuries with each passing workday. Such findings suggest that seafarers might also face injury risks later in their duty cycle. Guided by this mixed literature and the accounts from the interviews, this chapter delves into the relation between the frequency of occupational injuries among seafarers and the time elapsed in their duty tour. Consequently, two pivotal questions will be addressed:

1. Is there a discernible correlation between the frequency of occupational injuries among seafarers and the progression of their duty tour?
2. What factors influence the relationship between seafarers' occupational injuries and the duration of their tour of duty?

## 5.1. Data on Injuries from Shipping Enterprises

Data regarding the Lost Time Incident Frequency (LTIF) rate was collated from the three shipping companies in question. The LTIF rate illustrates the incidence of lost-time injuries per one million hours of exposure across the entire fleet of a company. Between 2010 and 2013, on a general scale, tanker-bound seafarers faced the highest risk of incurring a LTI (0.87), as depicted in Figure 4. Container ship crew had a similar risk level (0.86), while offshore vessel staff had the least (0.59).

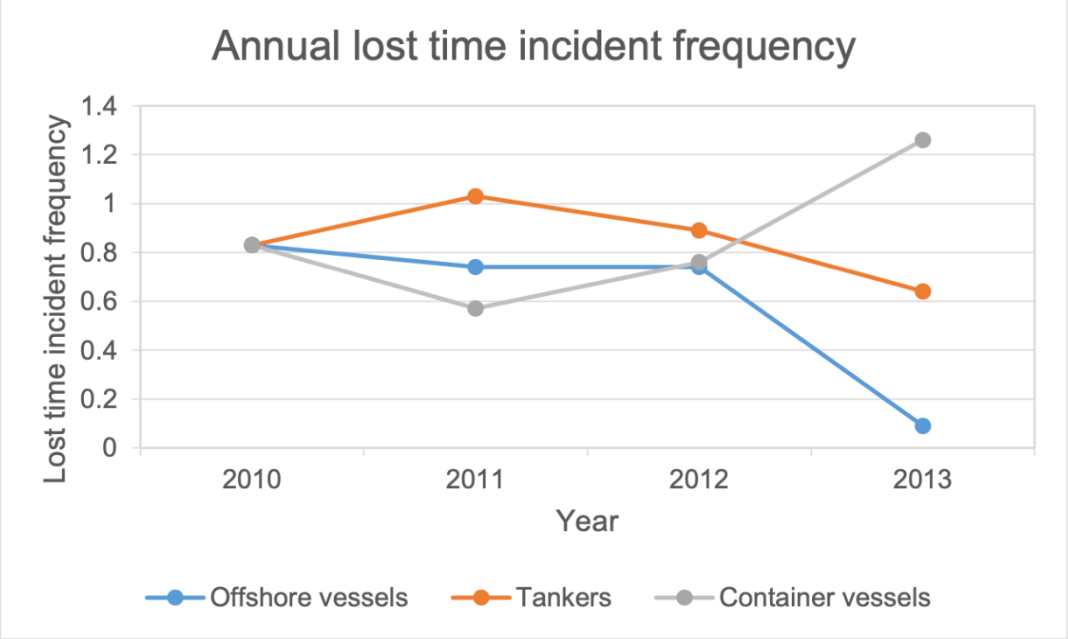



*Figure 4. Annual lost time incident frequency*

Figure 5 showcases the Total Recordable Case Frequency (TRCF) rate, which combines LTIs, Medical Treatment Cases (MTCs), and Restricted Work Cases (RWCs) per million exposure hours. Similar patterns emerge: offshore workers face the lowest injury risks (1.81), while those on container ships (2.54) and tankers (2.25) had higher rates.

From 2010 to 2013, a trend emerged from the data of the three shipping corporations: incident rates generally decreased annually, barring a few exceptions, as illustrated in figures 4 and 5. While LTIF and TRCF metrics aren't always openly shared, a benchmarking effort in 2011 by INTERTANKO recorded average LTIF and TRCF rates of 1.39 and 3.23, respectively, for its affiliated vessels. By this yardstick, all three companies under examination here outperformed the INTERTANKO mean, indicating their standing at the higher end of the shipping safety spectrum.

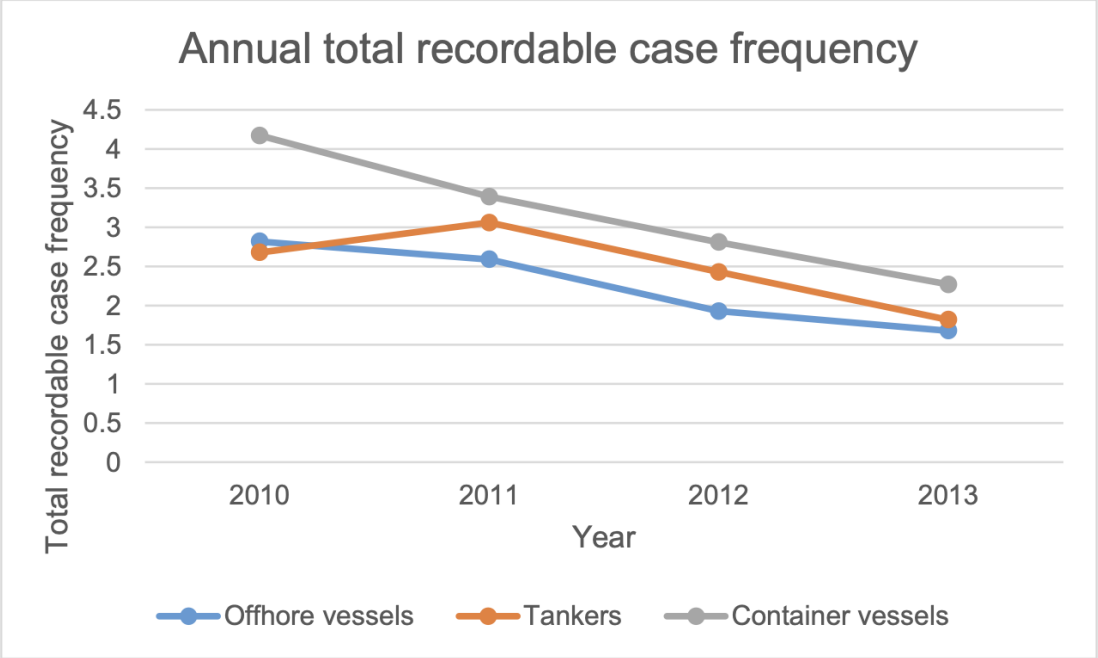



*Figure5. Annual lost time incident frequency*

### 5.1.1 Integrating Information from Various Maritime Companies

In all three data collections, injuries sustained by seafarers aboard the shipping companies' vessels were documented. However, as outlined in chapter three, the datasets weren't completely aligned in terms of the details they provided. For instance, while Company A supplied the anticipated departure date for the seafarer, Company C offered the actual departure date. A summarized overview of the data from each source is presented in table 10.

The datasets also spanned different periods. Company A's data accounted for incidents from 2012 to 2013. Company B's covered January 2010 through September 2013, and Company C's captured all of 2012. For clarity, companies A, B, and C will be referenced by their vessel types: tankers, offshore vessels, and container vessels, respectively.

Out of 650 incidents analyzed from the three maritime companies, 133 (20.5%) occurred on tankers, 404 (62.2%) on offshore vessels, and 113 (17.4%) on container vessels. Though there's a variation in the number of recorded injuries across the different ship types, it aligns with the differing timeframes and exposure hours.

| Shipping company | Vessel type | Date joined | Expected leave date | Actual leave date | Other independent variables[17] | Injury type |
|---|---|---|---|---|---|---|
| A | Tanker | ✓ | ✓ | ✓ | ✓ | ✓ |
| C | Container | ✓ | × | ✓ | × | ✓ |
| B | Offshore | ✓ | ✓ | × | ✓ | ✓ |

*Table. Data received from each shipping company*

### 5.1.2 Defining Variables and Classifying Injuries

Upon beginning the variable analysis, it was noticed that some variables either had ambiguous data or significant gaps, making them unusable. Hence, they were discarded. In the offshore data, the "activity when injured" and "cause of injury" were excluded due to sparse data. From the tanker dataset, several variables were eliminated either due to insufficient data or ambiguous entries. For instance, "control actions area improvement" was mainly labeled "not applicable."

For uniformity across datasets, some variables were redefined. These include 'body part injured', 'nature of injury', 'seafarer's rank', 'location of the injury on the ship', and 'seafarer's working department'. The categorization for 'body part injured' and 'nature of injury' was adapted from the UK HSE standards (Parkes and Swash 2000) and can be viewed in the table below. The categorization for the other variables, based on firsthand maritime expertise, is detailed in the table below.

| Part of the body injured | Type of injury |
|---|---|
| Arm | Break/fracture |
| Leg | Sprain/strain |
| Torso | Lacerations/open wounds |
| Head | Burns (scald/chemical) |
| Other | Bruise |
| | Other |

Recoding of 'part of the body injured' and 'type of injury' variables

| Rank of the injured seafarer | Shipboard location where the injury occurred | Working department of the injured seafarer |
|---|---|---|
| Officer | Hull | Deck |
| Rating | Engine room | Engine |
| Other | Superstructure | Other |
| | Other | |

Recoding of 'rank of the injured seafarer' and 'shipboard location where the injury occurred' variables

Injury severity was determined using the OCIMF 'Marine injury reporting guidelines', as classified by HSEQ Superintendents from each shipping company. Injuries were categorized into: Fatality, Lost Workday Case (LWC), Restricted Work Case (RWC), Medical Treatment Case (MTC), or First Aid Case (FAC).

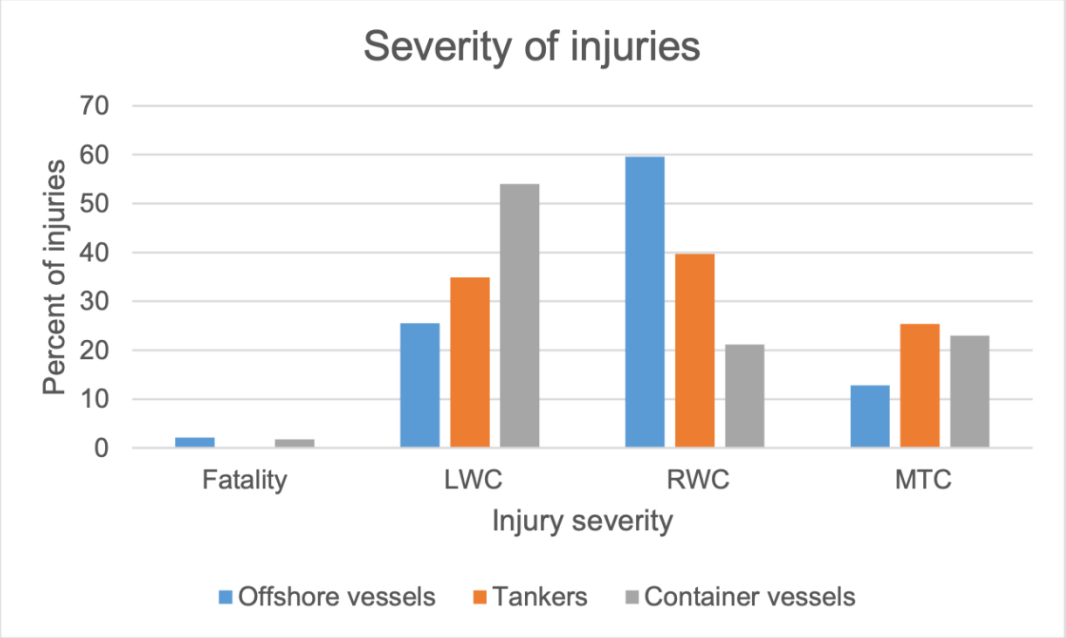
Given the data presented in chapter 4, some factors such as employment mode and rest hours, which are significant, weren't available in the datasets from the shipping companies. Hence, the study proceeded using only the aforementioned recorded variables. Subsequent analysis on injury severity distribution across ship types showed significant differences, as highlighted in table 13 (x2 34.357, d.f. 4, p <.0005).

### 5.1.3. Visual Representation of Injury Severity Across Companies

Figure 6 graphically depicts the data about injury severity for each shipping firm. Notably, no fatalities were recorded on tankers. Yet, both offshore and container vessels had two fatalities each within the surveyed period. Most injuries on container vessels were classified as lost time injuries, whereas offshore vessels mostly had restricted work accidents. Tankers exhibited a more balanced distribution across injury types, barring fatalities. The cause for these variations among the three ship types remains ambiguous. Literature review, as presented in chapter 1.1.2, pointed out that the tasks performed by seafarers differ depending on the ship type, but it's uncertain how these variations affect injury severity. Besides the incidents showcased in table 13 and figure 6, an analysis of 380 first aid cases, which constitute 58.5% of the recorded injuries, was also conducted. These cases came from both tankers and offshore vessels.

| Vessel type | Injury severity | | | | |
|---|---|---|---|---|---|
| | Fatality | LWC | RWC | MTC | Total |
| Tankers | 0 (0.0%) | 22 (34.9%) | 25 (39.7%) | 16 (25.4%) | 63 (100.0%) |
| Offshore | 2 (2.1%) | 24 (25.5%) | 56 (59.6%) | 12 (12.8%) | 94 (100.0%) |
| Containers | 2 (1.8%) | 61 (54.0%) | 24 (21.2%) | 26 (23.0%) | 113 (100.0%) |
| Total | 4 (1.5%) | 107 (39.6%) | 105 (38.9%) | 54 (20.0%) | 270 (100.0%) |
| $x^2$ 34.357, d.f. 4, p <.0005 | | | | | |

Injury severity across vessel types




Severity of injuries

### 5.1.4 Identifying Time Durations Within a Tour of Duty

For seafarers on offshore vessels, the typical tour duration was 35 days. However, on tankers, expected tour durations fluctuated between 45 to 339 days. Among those who reported incidents on tankers, the distribution of their tour durations varied: 18.0% had tours of three months or less, 43.6% between three to six months, 36.1% between six to nine months, and 2.3% had over nine months. As data related to the anticipated departure date was not furnished by the container ship company, precise expected tour durations for these seafarers remain unknown. Generally, they tend to have tours ranging from three to six months.

All three datasets included the elapsed days at the time of the incident, and these days were grouped into three phases - beginning, middle, and end of the tour - based on feedback from the seafarers during the study's qualitative phase.

For instance, a Deck Cadet mentioned, "The first week I don't know my way around...." and a Fourth Engineer noted, "For me the first week I'm always really tired...." Therefore, the beginning of a tour was categorized as the initial seven days on board.

Quantifying the end of a tour was similarly influenced by seafarers' feedback. For example, one Second Engineer remarked, “I’d say a week before I go home.....” and a Chief Engineer noted, “My last week of my trip is a quieter time for me....” Therefore, the end of a tour was defined as the final seven days anticipated on board.

It's vital to emphasize that the expected departure date was used rather than the actual departure date. This decision stemmed from the interview findings indicating that seafarers' perceptions align more with their expected departure. For example, a Captain noted, “When they [ratings] start to get in the end of 6 months, then they are already home some of them in the head.”

Injuries occurring during a tour extension were thus included in the 'end of tour' category for this chapter's analysis. The 'middle of tour' category encompasses incidents that didn't fall into either the start or end of the tour categories.

A Fourth Engineer from ship 2 once shared: "In my initial week onboard, I consistently feel exhausted."

Thus, for this analysis, the commencement of a duty tour was marked as the first seven days a sailor spent on the ship, with their first day onboard treated as the inaugural day. Defining the conclusion of a duty tour followed a similar approach, based on feedback from the sailors. As an instance, a Second Engineer from ship 2 mentioned: "The week leading up to my departure is when I feel it's time to go home."

In a parallel sentiment, a Chief Engineer from ship 2 conveyed: "My concluding week onboard is relatively more peaceful." Another individual, a Storekeeper from ship 1, indicated: "During the final week, though I'm not as exhausted, I can feel the weight of working 12-hour shifts for seven continuous days. By this week, I'm eagerly looking forward to reaching home."

As a result, the concluding phase of a tour of duty was categorized as the final seven days a sailor anticipated being onboard, with the projected departure day treated as the seventh day. Throughout the study, the arrival and departure days were counted as complete days. It's essential to highlight that the sailor's anticipated departure date was utilized over the actual departure date. This preference stems from interview insights which showed that sailors' feelings and anticipations were more aligned with their projected departure. As an illustration, to be explored further in the upcoming chapter, a Captain from ship 4 voiced:

"As sailors approach the conclusion of their 6-month tenure, many mentally start feeling they're already back home, even if they're still onboard."

This perspective, combined with the Storekeeper's aforementioned reflection, underscores the sailors' collective sentiment of a mental transition as they draw near the end of their duty span, regardless of any extensions to their stay.

Given this understanding, any injuries sustained during extended tour durations were incorporated under the 'end of tour' category throughout this chapter. The 'middle of tour' segment encompasses incidents that transpired outside the defined beginning or conclusion of a tour.

## 5.2. Questions

Question 1: Is there a discernible correlation between the frequency of seafarers' work-related injuries and the progression of their duty tour?

To delve into this inquiry, the occurrence rates at the commencement, midpoint, and culmination of a duty tour were juxtaposed across the three shipping firms. As detailed in table 14, offshore vessels manifested a pronounced spike in incidents at the tour's outset compared to both tankers and container vessels. Nonetheless, this shouldn't be misconstrued as heightened vulnerability during the initial phase of offshore vessel tours. Given the abbreviated tour durations for offshore sailors, the span labeled as the tour's midpoint was considerably brief compared to the intervals for those aboard tankers and container vessels. For instance, the midpoint of a tour for the offshore sailors examined in this study spanned three weeks, while it ranged between seven weeks to over nine months for those on tankers and container vessels.

Moreover, the curtailed tours and correspondingly condensed leave periods for offshore sailors meant they embarked on more tours annually, implying more frequent tour commencements and conclusions. Crucially, it wasn't feasible to analyze the tour's end for container vessels due to a lack of data on anticipated departure dates.

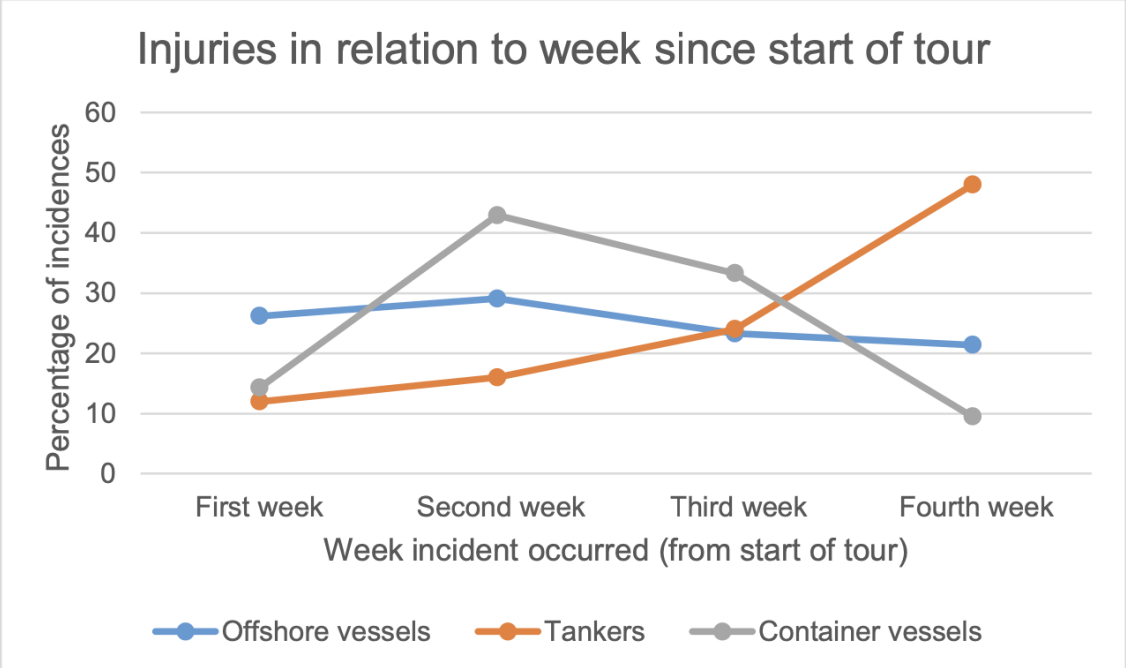
| | Tankers | Offshore vessels | Container vessels |
|---|---|---|---|
| Start of tour | 3 (2.3%) | 82 (20.9%) | 3 (2.9%) |
| Middle of tour | 120 (90.2%) | 240 (61.2%) | 102 (97.1%) |
| End of tour | 10 (7.5%) | 70 (17.9%) | |
| Total | 133 | 392 | 105 |

Injuries in relation to time into tour onboard tankers, offshore vessels and container vessel

A chi-square analysis (X2 14.061, d.f 4, p <.001) indicated a non-uniform injury distribution, with offshore vessels showing fewer incidents towards a tour's end than other periods. Contrary to a linear decline in risk over the tour's duration, these findings demonstrated varying risks. This contrasts with the methods and outcomes of Jensen et al. (2004), which did not spotlight risk differentials across varied timeframes within a full duty tour.

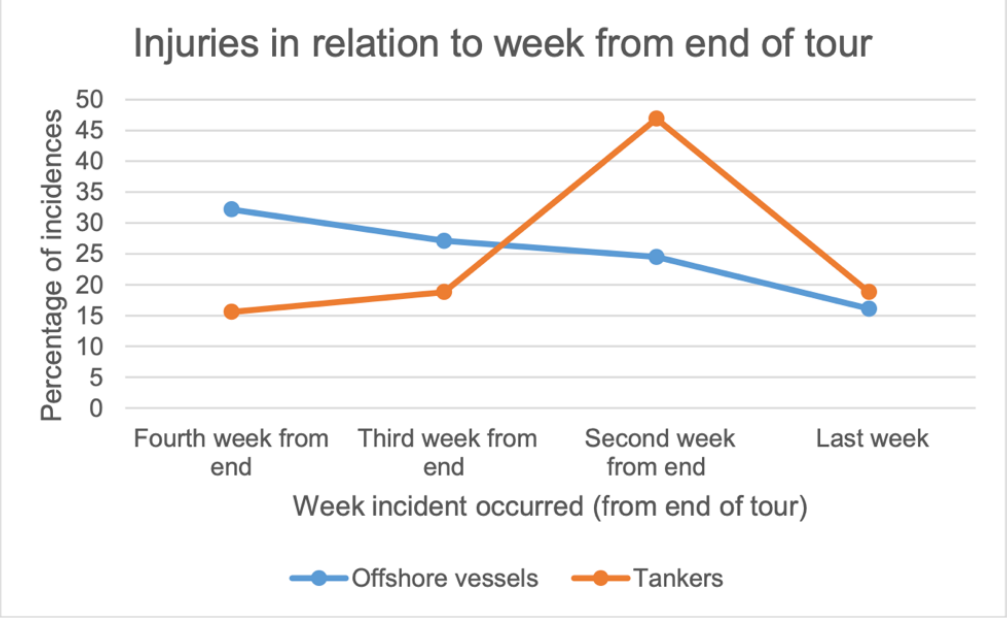
Beyond the data presented in table 14, 30 incidents transpired post the sailor's anticipated departure date. These instances constituted nearly 7% of offshore vessel injuries and 3% of tanker injuries. The unavailability of expected departure dates for container vessels precluded determining the occurrence rate of such injuries aboard them. Moreover, numerous complexities render limited conclusions about the frequency of these incidents.

Since the duty tour durations varied for sailors on tankers and container vessels, a chi-square test for every tour week wasn't feasible. To navigate this limitation, the initial four weeks of a duty tour were assessed for injury incidence frequency. In this evaluation, injuries occurring during tour extensions were omitted.



Injuries in relation to week since start of tour onboard tankers, offshore vessels and container vessels

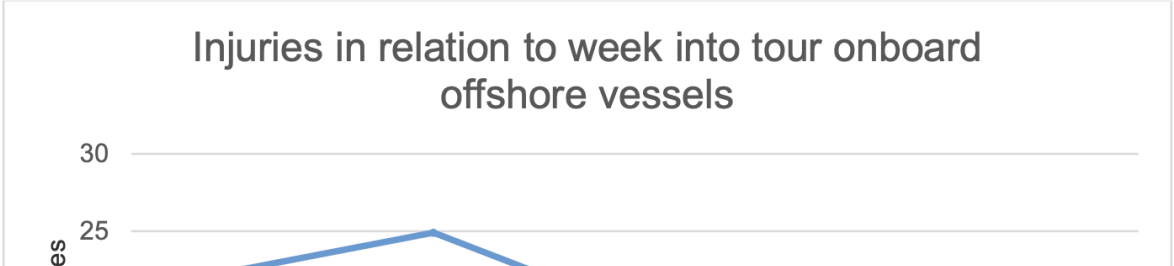
The chi-square analysis (x2 7.800, d.f. 3, p <.05) unveiled significant differences in injury distribution over the first four weeks of tankers' tours, with the fourth week witnessing a heightened risk. In contrast, no notable disparities were observed for offshore or container vessels during this period. The injury distribution over the four-week span is delineated for each dataset in the subsequent figure.




Injuries in relation to week from end of tour onboard tankers and offshore vessels

Aboard tankers, there was a notable spike in incidents during the fourth week of their duty tour, in contrast to the initial three weeks. The previous figure indicates a consistent uptick in incidents as the first four weeks advanced. On container vessels, within their initial four weeks, the distribution of incidents seemed random.

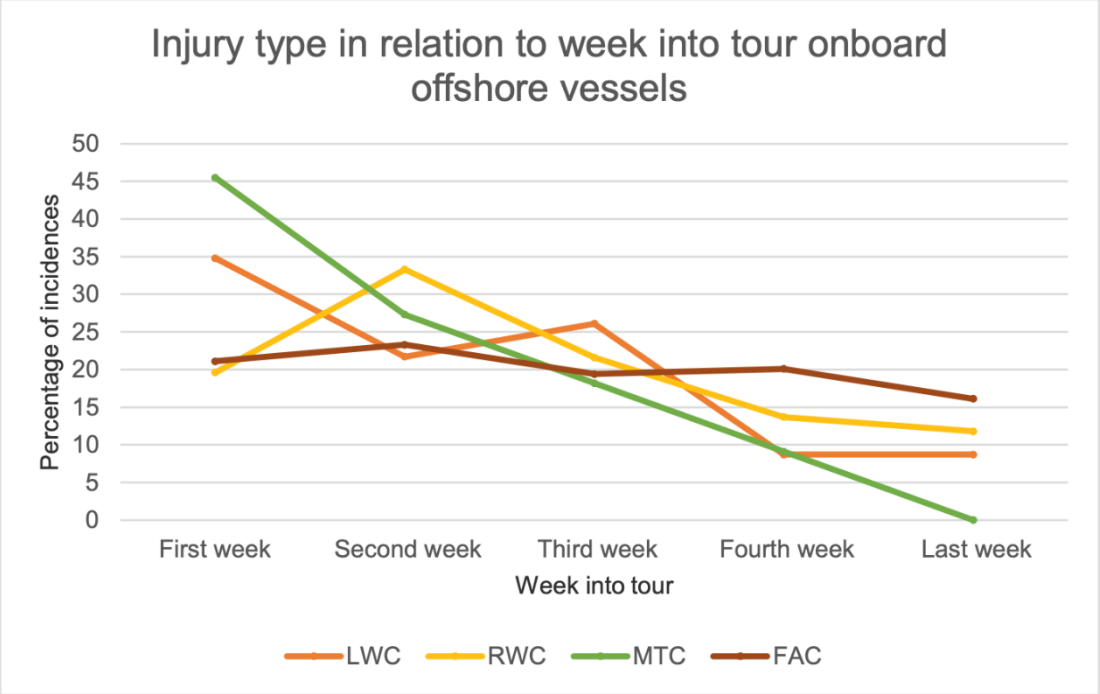
What's particularly intriguing about the offshore vessels is the absence of any significant pattern for incidents in the first four weeks, especially considering these vessels have a tour duration of just five weeks. When viewed holistically, however, a significant pattern does emerge, which is illustrated in the figure below.



Injuries in relation to week into tour onboard offshore vessels

The following figure showcases the number of incidents based on the progression of the last four weeks of a tour for both tankers and offshore vessels. Given the data limitations with container vessels (lacking the expected departure date), they couldn't be included in this analysis. Both tankers and offshore vessels showed significant variations in their incident distribution across these last four weeks. Specifically, tankers had a heightened risk during the second-last week, while offshore vessels experienced a linear decline, making their final week the safest.

These results further emphasize the tangible link between the incidence of seafarers' injuries and their progression into their duty tour. The reasons for the heightened incidents in the penultimate week on tankers remain ambiguous, with the literature from chapters one and two offering minimal clarification. Offshore seafarers, given their consistent duty length, allowed for an exhaustive analysis of incidents spanning their entire tour. As depicted in the following figure, there's a significant shift in incident frequency when examining it on a weekly basis for the entirety of the tour. Most notably, incidents peak during the second week, with the final week being the safest.



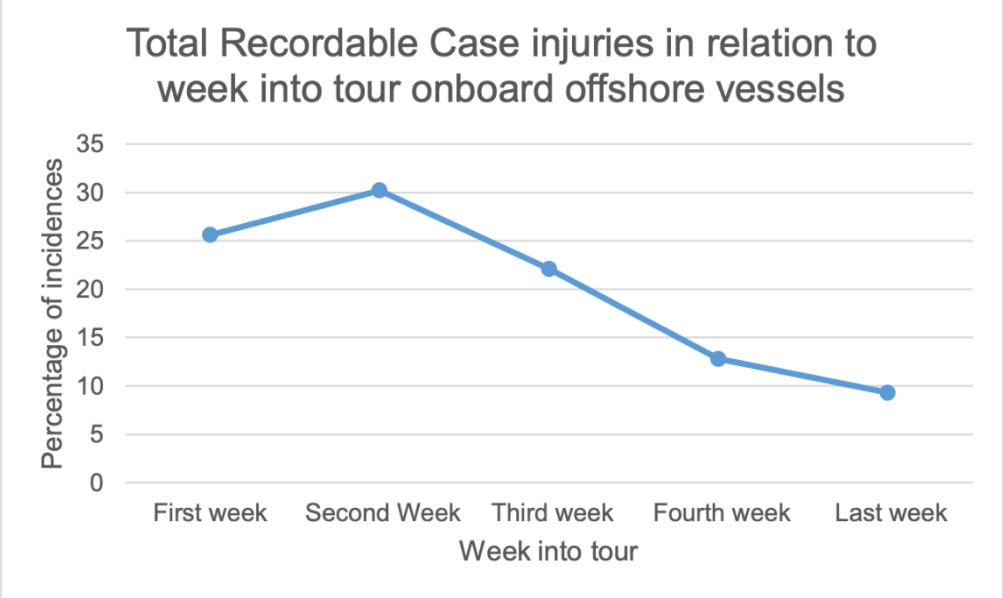

Injury severity in relation to week into tour onboard offshore vessels

Taking into account the findings of the figures for offshore vessels, it's evident that the relationship between incidents and time into the duty tour becomes significant primarily in the last week. This underlines the importance of analyzing the entirety of a seafarer's tour when assessing occupational safety. Previous research, like that by Hansen et al. (2002) and Jensen et al. (2004), focused on incidents in relation to the elapsed time since the start of a deployment. Such an approach might miss the nuances revealed here for offshore vessels. Addressing the initial question — if there's a significant link between seafarers' occupational injuries and their time into the duty tour — the answer is affirmative for both offshore vessels and tankers. Container vessels don't show this pattern, though incomplete data might have influenced this conclusion.

Finally, a deeper dive into injury incidents, in relation to their severity as the tour progresses for offshore vessels, is displayed in the following figure. This illustrates the distribution of incidents based on injury severity throughout the entire duty tour for these vessels.

Statistical testing for injury severity across an entire tour wasn't feasible due to insufficient frequencies in the necessary categories. Yet, there was the capability to assess the spread of recordable cases (comprising fatalities, lost workday cases, restricted work cases, and medical treatment cases) throughout the whole tour for offshore seafarers. The spread of incidents categorized as recordable cases for offshore vessels significantly varied across the

tour (x2 13.186, d.f. 4, p <.05). Notably, the last week of a tour displayed the lowest probability for a seafarer to sustain a recordable case injury, in comparison to the preceding four weeks. This distribution is illustrated in the following figure.




More severe incidents in relation to week into tour onboard offshore vessels

This chi-square result suggests that, for offshore vessels, there were fewer recordable case injuries in the tour's last week than would be randomly expected. This observation indicates that even after removing the less severe first aid case injuries from the equation, a significant correlation between seafarers' injuries and time into the tour still stands out. This implies that the prevalence of less severe first aid case injuries doesn't overshadow the discerned link between occupational injuries and time into the tour. Given the inability to conduct detailed analyses based on the severity of the injuries, it's regrettable that further insights into the relationship between injury severity, seafarers' incidents, and time into the tour remain elusive.

The notable chi-square result underscores the importance of delving deeper into the association between incidences of seafarers' occupational injuries and their progression within a duty tour. For instance, understanding specifics like the location of the incident onboard and the rank of the injured seafarer could provide insights into the likelihood of injuries occurring at certain points within a duty tour.

Question 2: Which factors are associated with occurrences of seafarers' occupational injuries during different phases of a tour of duty?

To delve into this query, several binary logistic regressions were carried out. Given that all the independent variables were nominal with predefined categories and no hierarchical structure, binary logistic regression surfaced as a suitable analytical approach.

The regressions performed included:

1. Comparing the start of a tour with subsequent phases (middle and end).
2. Comparing the end of a tour with preceding phases (start and middle).
3. Direct comparison between the start and the middle of a tour (excluding end-of-tour incidents).
4. Direct comparison between the end and the middle of a tour (excluding start-of-tour incidents).

This approach was designed to contrast incidents at the beginning and end of a tour both against any other period within the tour and specifically against the mid-tour phase.

Five distinct variables were pinpointed for inclusion in the logistic regression models:

1. The rank of the injured seafarer.
2. The nature of the injury.
3. The specific location onboard where the injury took place.
4. The body part that was injured.
5. The working sector of the injured seafarer.

As touched upon in section 5.1.2, these variables underwent recoding and, when needed, were amalgamated to create new variables. After scrutinizing for missing values, Pearson chi-square tests evaluated the relationship between the target variable (timing of the incident within the tour) and the predictors. Standardly, a p-value of $<.05$ was deemed significant. Unfortunately, no distinct relationship could be pinpointed between any of the five independent factors and the outcome variable (timing within the tour).

Before running the logistic regressions, checks for multi-collinearity among the predictors were made, which revealed no significant multi-collinearity issues. Upon analyzing incidents from both tankers and offshore vessels collectively, the model comparing the rest of the tour (start and middle) vs. end showed no significant predictors. Moreover, the overall model fit was suboptimal. However, the other three logistic regression models did yield significant predictors. As illustrated in the subsequent table, seafarers working in the engine

room had a 66% reduced likelihood to report injuries at the tour's start compared to those in the 'other department' category. Likewise, deck department seafarers had a 75% lesser probability of reporting injuries at the tour's onset than their 'other department' counterparts.

| | Odds ratio | 95% CI |
|---|---|---|
| **Department** | | |
| Other Department (n= 159) | 1* | |
| Engine Department (n= 111) | 0.34* | (0.12-0.92) |
| Deck Department (n= 142) | 0.25** | (0.11-0.59) |

Note R2 .066 (Cox and Snell), .115 (Nagelkerke). Model x2 13.158, d.f. 8, p .107. * p < .05, ** p <.005.Start of tour vs. all later incidents logistic regression (tankers and offshore vessels)

The table below presented indicates that seafarers in the engine department and the deck department had a reduced likelihood (71% and 79% respectively) of reporting an injury at the beginning of a tour when compared to their counterparts in other departments, especially during the middle of the tour.

| | Odds ratio | 95% CI |
|---|---|---|
| **Department** | | |
| Other Department (n= 134) | 1** | |
| Engine Department (n= 95) | 0.29* | (0.10-0.83) |
| Deck Department (n= 126) | 0.21** | (0.09-0.51) |

Note R2 .080 (Cox and Snell), .143 (Nagelkerke). Model x2 10.151, d.f. 8, p .255. * p < .05, ** p < .005. Start of tour vs. middle of tour logistic regression (tankers and offshore vessels)

The table below illustrates that a seafarer in the deck department had a 60% lower likelihood of reporting an incident towards the end of their tour when compared to the middle of their tour, especially when contrasted with seafarers from other working departments.

| | Odds ratio | 95% CI |
|---|---|---|
| **Department** | | |
| Other Department (n= 128) | 1 | |
| Deck Department (n= 130) | 0.40* | (0.18-0.88) |

Note R2 .040 (Cox and Snell), .067 (Nagelkerke). Model x2 9.026, d.f. 8, p .340. * p < .05. End of tour vs. middle of tour logistic regression (tankers and offshore vessels)

The four binary logistic regression models, as previously described, were also applied solely to incidents that occurred onboard offshore vessels. The results yielded similarities. No significant variables were identified when comparing the rest of the tour (starting and middle phases) versus the last week of the tour, with a resulting R2 value of .037 (according to Cox and Snell) and .061 (according to Nagelkerke). The model's chi-square value was 8.840 with a significance level of p .356. Contrary to the combined analysis of tanker and offshore vessels, no significant variables emerged for the middle of the tour versus the end of the tour (excluding the start of the tour) with a significance level of p .175 for incidents exclusively onboard offshore vessels.

As presented in the subsequent table, it's evident that deck department seafarers had a 61% reduced probability of reporting an injury at the beginning of a tour when juxtaposed with seafarers from other working departments.

| | Odds ratio | 95% CI |
|---|---|---|
| **Department** | | |
| Other Department (n= 138) | 1 | |
| Deck Department (n= 76) | 0.39* | (0.16-0.96) |

Note R2 .065 (Cox and Snell), .115 (Nagelkerke). Model x2 7.048, d.f. 8, p .531. * p < .05. Start of tour vs. all later incidents logistic regression (offshore vessels)

Similarly, when examining the likelihood of a seafarer from the deck department reporting an injury at the beginning of a tour (compared to the middle of the tour), they were 66% less likely to do so than a seafarer from another department, as illustrated in the table below.

| | Odds ratio | 95% CI |
|---|---|---|
| **Department** | | |
| Other Department (n= 115) | 1 | |
| Deck Department (n= 62) | 0.34* | (0.13-0.87) |

Note R2 .084 (Cox and Snell), .124 (Nagelkerke). Model x2 8.822, d.f. 8, p .358. * p < .05. Start of tour vs. middle of tour logistic regression (offshore vessels)

From the datasets of tankers and offshore vessels, it became evident that certain elements of a seafarer's working department played a significant role in predicting when injuries might occur during a tour of duty. For the combined dataset of incidents from tankers and offshore vessels, the seafarer's working department was found to be a significant predictor for incidents at the start of the tour versus later stages, the start of the tour versus the middle, and the end of the tour versus the middle.

When the data from offshore vessel incidents was isolated and analyzed separately, the seafarer's working department emerged as a significant predictor only for the start of the tour versus all subsequent stages and the start of the tour versus the middle. The reasons for this disparity, especially regarding the end of the tour versus the middle of the tour, when comparing combined data versus offshore-only data, are not readily apparent.

In response to the posed question, "What are the variables that relate to incidences of seafarers' occupational injuries and time within a tour of duty?", the only factor identified that had a relation to the timing of injuries within a tour of duty was the seafarer's specific working department.

The results, or more precisely the absence of significant findings, from the binary logistic regression models hold importance. While earlier in this chapter a significant relationship between seafarers' occupational injuries and time within a tour of duty had been identified, the data provided by the shipping companies doesn't shed much light on the underlying reasons for this relationship.

The analyses highlight the extensive range of variables that shipping companies did not record following an injury. Details such as the employment nature of the injured seafarer, their familiarity with the vessel, or their overall experience at sea were absent. The significant gaps in the information captured by shipping companies present a major constraint when using their safety data to understand seafarer safety in relation to work organization and employment conditions at sea.

# Chapter VI. Discussion.

In this chapter, the main insights from the research, which have been presented in prior chapters, are reviewed. This chapter provides a sociological perspective on certain effects of work organization and relationships on seafarers. It delves into how these factors influence the health, safety, and overall well-being of individuals working at sea. The chapter is structured around five primary themes.

The chapter starts by focusing on the exploitation of the seafaring workforce. One key form of exploitation identified in the study is the use of unstable employment strategies. These strategies are deeply embedded in the employment structures at sea, leading to increased vulnerability for seafarers. For instance, some seafarers are placed onboard ships without

having adequate rest prior, which affects their health and safety, as discussed in previous chapters.

Next, the diversity of the seafaring workforce is addressed. While in previous chapter, it was observed that the three shipping companies viewed seafarers as a uniform group, subsequent analysis in chapters four and six indicated varying levels of empowerment among seafarers. This disparity had profound implications for their occupational health, safety, and well-being. Job control at sea is the focus of the fourth theme. Living and working in the same environment means seafarers can be called upon for tasks at any time. The degree of job control varied significantly among seafarers based on their employment circumstances, revealing marked disparities within the workforce. Those with more power could counteract some of the negative aspects of their employment conditions.

By examining the health, safety, and well-being outcomes stemming from these employment conditions, this chapter also illuminates the larger issues of labor market dynamics in a deregulated global sector. The diminished influence of labor unions, coupled with deregulation, has notably weakened labor's stance in the maritime industry. Through exploring seafarers' experiences in relation to their working conditions, this chapter offers deeper insights into the real-world effects of global industry employment dynamics.

Delving into the exploitation of the seafaring workforce, various aspects of work organization and employment at sea emerge, hinting at a larger exploitation narrative. Precarious employment practices, which render seafarers vulnerable, became evident throughout the analysis. Such employment conditions have been linked to negative impacts on workers' health, safety, and overall well-being in prior research. The chapter begins its discussion focusing on this theme, delving into fatigue as an offshoot of labor exploitation in the maritime sector.

The precarious nature of seafarer employment aligns with the definitions laid out in the literature review. Predominantly characterized by short-term contracts and lacking in job security and benefits, many seafarers in this study and in prior research have been found to be engaged in such unstable employment arrangements. Research in various land-based industries indicates that unstable employment can negatively affect the health, safety, and overall well-being of employees. Quinlan (1999) posited that unstable employment can lead to increased chaos within the workplace. As a result, employees are directly exposed to market pressures, often sidelining their occupational health and safety needs. Such employment changes can cause workers to face uncertainty regarding their job stability, leading to deteriorating working conditions as they strive to ensure continued employment.

In this study, the negative effects of unstable employment on seafarers were evident in multiple ways. Primarily, shipping companies display minimal commitment or direct engagement with specific groups of seafarers. From a regulatory viewpoint, a shipping company's main responsibility is to ensure the presence of the right number of certified seafarers on board. Walters and Bailey (2013) noted that the responsibility of sourcing certified individuals can be easily transferred to a third party. This practice has become increasingly common in the seafaring industry, especially with the flagging out of ships. The subsequent impact on work relations at sea is profound and unparalleled in terrestrial industries. However, the employment instability that seafarers face mirrors many of the negative effects observed in land-based employment studies. For instance, it was observed that seafarers were often allocated to different shipping firms and vessel types by staffing agencies. Additionally, seafarers with unstable employment often faced uncertainty in their income, leading many to settle for suboptimal job conditions.

Furthermore, a study by Lewchuk et al. (2003) identified income unpredictability, as observed among the seafarers in this study, as a factor contributing to employment-related stress. According to their employment stress model, workers with unstable jobs face risks arising from their employment's inherent insecurity. This model emphasizes the broader employment experience of an individual beyond their immediate workplace.

Other research on land-based workers with unstable jobs across multiple workplaces has shown that such workers often grapple with health, safety, and well-being challenges due to their transitory work environments. This is relevant for seafarers who typically rotate among different ships for their assignments, encountering diverse work settings.

This study highlighted a concerning trend where unstable employment and the resulting financial uncertainty led seafarers to board vessels regardless of the rest period they had previously had. For instance, one seafarer had been at sea for almost ten out of the last twelve months. This finding suggests that such occurrences are not unique to the participants of this study, given that it probably tapped into a more favorable side of the seafaring industry. Walters and Bailey (2013) mentioned that due to pressures from staffing agencies, it's not unusual for seafarers, after a nine-month contract, to go back to work following just one month off, contributing to exhaustion. This is especially prevalent in emerging labor supply countries where seafarers are very conscious of how easily they can be sidelined by recruitment agencies, affecting their future job prospects. The lack of safeguards for seafarers from these pressures is alarming.

To comprehend this, one needs to delve into the industry's regulatory capabilities and its willingness to regulate. Before the 1980s, local seafaring labor markets were somewhat shielded by national regulations. However, the rise of open registries in the 1980s deregulated these markets, allowing ship owners to wield more power. This shift allowed ship owners to pull workers from a global talent pool, leading to recruitment of seafarers from developing countries at lower wages and less favorable terms. Given the industry's vulnerability to varying freight rates and fixed operational costs, it makes sense that efforts would be directed towards lowering labor costs.

Further, open registries have diluted the power of trade unions. The fragmented nature brought about by open registries means that national trade unions struggle to champion their members' rights. Bhattacharya and Tang (2013) argued that while local trade unions could theoretically support seafarers through bargaining within a national scope, internationally their influence diminishes. So, even if seafarers belong to national unions, these entities often lack the resources to challenge ship owners, especially those from developing nations. As a result, these unions are ill-equipped to shield seafarers from shipping companies' and recruitment agencies' pressures, leaving seafarers without a strong voice.

While certain national policies, like the USA's Merchant Marine Act, aim to protect their domestic seafaring labor market, such protection is increasingly rare, benefiting fewer seafarers. With the absence of such regulations and the weakened presence of trade unions, ship owners have greater latitude in labor exploitation.

Other industries, like the UK's offshore energy sector, showcase the positive role national regulations can play in labor protection. For instance, in the UK offshore realm, workers are shielded from prolonged deployments and insufficient rest periods. If the seafaring industry adopted similar protections, it would limit ship companies' and recruitment agencies' power over seafarers.

However, the absence of such protective measures in the seafaring sector, coupled with the diminished power of trade unions, means it's not surprising that seafarers face excessive deployments and insufficient rest periods. This issue is further complicated by shipping companies' failure to record essential data like seafarers' rest durations before boarding. The lack of comprehensive information on seafaring work conditions and employment will be further explored in this chapter.

Ship owners are strategically employing crew members from various countries to strike a balance between skills and costs (Lane 2002). This leads to the formation of multi-national crews, preventing any one nation from dominating the seafaring labor market (Kahveci and

Nichols 2006). Additionally, employing multi-national crews hinders the formation of a unified trade union identity, further weakening their bargaining power (Walters and Bailey 2013).

The study revealed not only employment instability but also significant disparities in employment conditions. For instance, seafarers from different nationalities had varying lengths of deployments, and those from less economically developed nations often accepted longer durations with less negotiation power. This observation aligns with Drewry (2009), which noted differences in deployment and leave rates among officers of different nationalities. Seafarers from more developed nations generally had longer leave periods. This inequality means seafarers with less power work longer with shorter leaves, reducing crew change costs for operators. Ultimately, ship owners profit from this disparity while seafarers face the repercussions.

These disparities also have implications for seafarers' health, safety, and well-being. Extended deployments raise concerns about fatigue and declining performance. Inequalities in employment conditions, especially disparities in deployment durations, cause significant stress and frustration among seafarers. Studies like Hansen et al. (2002) and Jensen et al. (2004) may not accurately capture the situation due to not considering the varying lengths of individual deployments.

The data analyzed suggests that seafaring isn't a uniform occupation. While safety records treat all seafarers similarly, this study indicates a varied workforce with diverse employment terms. Ship companies might overlook these factors, which could be critical for understanding health, safety, and well-being outcomes.

The overarching theme reveals the lack of protective mechanisms for seafarers concerning their employment structures and an absence of platforms for them to voice their concerns.

Job control was a central theme that emerged from the findings. Seafarers often had uncertain deployment schedules, creating stress and unpredictability. Land-based studies have shown that well-being improves when individuals perceive they have control over their work schedules (Lewchuck et al. 2008). This section discusses the uncertainties and certainties of deployment schedules.

Many seafarers faced unpredictable deployment schedules, with little notice before they had to join a vessel. This unique predicament isn't common in other professions. Those who couldn't meet short-notice requirements caused delays for others already onboard, extending their deployment. This mandatory extension of tours was a major concern, with studies

indicating that unpredicted extensions can lead to mental health problems (Buckman et al. 2010).

This power imbalance between shipping companies and seafarers is evident. The unpredictability of work schedules had adverse effects on seafarers, like the inability to manage their work effort. Studies indicate that such uncertainty can have detrimental psychosocial effects (Carter 2005). Given that all roles at sea have safety implications, any reduction in performance, even due to psychological reasons, can be risky. Upon circulating the study details online, the researcher garnered interest from a select group of participants. To facilitate their involvement, the researcher engaged with these individuals remotely, utilizing online communication platforms. This allowed to effectively gather their insights and answers to the research questions, ensuring that the study's objectives were met seamlessly.

## Conclusions

This final chapter outlines the primary outcomes of the research and illustrates how the study answered the research question using both qualitative and quantitative methodologies. While summarizing, the chapter also points to certain constraints of the research, like challenges in accessing safety data from shipping companies. The chapter concludes with insights on the findings and suggests potential solutions to the issues uncovered, emphasizing the importance of enhanced incident reporting by shipping companies.

Given the significant shifts in employment and labor market structures in the maritime sector since the 1970s, this research aimed to understand the effects of current work arrangements in the seafaring industry on the safety, health, and well-being of maritime

workers. The central research question of this study was: How do work organization and employment structures at sea influence the health, safety, and well-being of seafarers? Specifically, the study delves into seafarers' work routines, focusing on when and where they face the most challenges regarding health, safety, and well-being, while also exploring the reasons and outcomes of these challenges.

The literature review, primarily based on studies related to health, safety, and well-being in land-based sectors due to the limited literature in the maritime context, indicated that negative outcomes in health, safety, and well-being can be traced back to employment structures and the way work is arranged at sea. The literature underscored that across industries, occupational mishaps often occur during the initial phases of a worker's tenure, especially if they aren't familiar with the specific workplace (as noted by Underhill, 2007). This observation is notably relevant for the maritime sector where, after a tour of duty, seafarers typically don't return to the same vessel for subsequent assignments. However, other research focusing on continuous work shifts in land-based jobs discovered that the risk tends to grow with consecutive workdays (cited by Folkard and Lombardi, 2006). Studies also indicated that as a seafarer's tour of duty advances, their fatigue upon waking intensifies (as shown by Wadsworth et al., 2006). Such findings directed this research to delve deeper into the work and employment patterns within the maritime sector.

To answer the research question, a combined methodological approach was adopted. The study's quantitative aspect relied on safety data sourced from three global shipping companies, encompassing 650 incidents resulting in injuries, varying from fatalities to minor injuries requiring only basic first aid. This was paired with a qualitative analysis, where the semi-structured interviews were carried out on four ships. This provided a comprehensive and profound insight into the health, safety, and well-being of seafarers in connection with their work and employment conditions at sea.

The research encountered several constraints, as detailed in chapter 3.1. Undertaken by a solitary investigator, challenges such as restricted time and financial resources were evident. This segment will shed light on potential improvements for the study. While the insights from these interviews were valuable, a more extended stay might have yielded even richer data. The constrained timeframe posed challenges in building rapport with participants, which might have affected the depth of some responses. Had the researcher traveled with the vessels, it would have enabled direct observations of individuals performing their roles and interacting in their work environment, as Whitfield and Strauss (1998) suggested. There's a distinction between a researcher's immediate observations and an interviewee's retrospective account. The

stories shared by seafarers were based on memories, which could be affected by factors like personal significance, as noted by Whitfield and Strauss (1998). Direct observations, on the other hand, would have been noted in real-time. However, seafarers' recollections offered unique perspectives that might not have emerged from mere observation.

Upon circulating the study details online, the researcher garnered interest from a select group of participants. To facilitate their involvement, the researcher engaged with these individuals remotely, utilizing online communication platforms. This allowed to effectively gather their insights and answers to the research questions, ensuring that the study's objectives were met seamlessly.

Chapter 3.2.1 emphasized the challenges associated with analyzing seafarers' injury data, primarily stemming from access issues. Acquiring injury records from three prominent multi-national shipping companies was a significant achievement, but not without its challenges. There were also barriers related to collecting secondary data. Primarily, the researcher was limited to the data the gatekeepers, typically the shipping company's health and safety superintendents, permitted access to. This dependence meant that the veracity of the data couldn't be independently verified, and certain critical information might be withheld. As highlighted in chapter three, one of the superintendents even declined to share data regarding when the injured seafarers were scheduled to leave the ship. Still, these issues were somewhat balanced by sourcing data from multiple shipping companies and blending qualitative methods with quantitative data analysis.

Despite securing injury data spanning several years for extensive fleets, a larger number of injury incidents would have facilitated deeper analysis. Additionally, without the denominator population of the seafarers, the scope for relevant and valuable analysis was limited. This denominator would have indicated the total number of individuals exposed to risk, allowing for an evaluation of the frequency of reported incidents relative to the entire population at risk.

The fact that the three shipping companies granted the researcher, albeit limited, access to their safety records suggests that these companies operate with a degree of transparency, representing the more reputable side of the seafaring industry. While this study has showcased injury patterns for these three companies, it may not encompass potential challenges faced by seafarers at the less reputable end of the industry spectrum. Analyzing a broader segment of the seafaring industry might unearth even more significant issues.

## Reflections

This thesis shed light on the effects of the structure of work and maritime employment on the health, safety, and well-being of seafarers. Several potential solutions to the challenges faced by these workers are presented in this section.

One solution to combat the negative impact of unfamiliarity on well-being is for seafarers to be redeployed on familiar ships. While previous studies have highlighted the benefits of such practices in terms of safety outcomes, this research has expanded on these findings, suggesting the positive effects on overall well-being. However, when redeployment on familiar vessels isn't feasible, an extended transition period might help ease some of the challenges associated with unfamiliar workplaces.

Addressing fatigue issues, especially after long travels, could be improved by considering various factors, including travel duration and time zone changes, to ensure adequate rest. Moreover, by fostering transparent communication with their seafarers regarding scheduling and mandatory tour extensions, shipping companies could alleviate some associated challenges.

A significant issue pinpointed in this study was the inadequacy of shipping companies' incident reporting procedures. A universal standard for incident reporting could be beneficial. However, given the regulatory challenges, an emphasis on detailed incident recording by individual companies could be more pragmatic.

Moreover, the reluctance of seafarers to report injuries due to potential repercussions highlights a pressing concern. Shipping companies need to establish trustworthy reporting environments, ensuring no punitive measures for reporting injuries.

In conclusion, while this research provides insights into the health, safety, and well-being of seafarers in relation to their work structure and maritime employment, it's not exhaustive. Further research, exploring other sectors of the maritime industry or delving deeper into the implications of familiar workplaces, could be beneficial. The study also emphasizes the necessity of understanding and measuring the impacts of work and employment structures on worker health, despite the challenges. And while finding solutions may be complex, the challenges should serve as a motivation to delve deeper into the issues faced by seafarers.

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## APPENDIX I: INTERVIEW GUIDE

Three main areas:

1. Risks at sea
2. Time
3. Injuries at sea

### Background

1. Can you start by telling me a bit about your background as a seafarer?
    - - What ticket do you hold?
    - - What is your role in your current rank?
    - - How long have you worked at sea?

- - What other ship types have you worked on?
- - How long have you worked for your current employer?
- - How long have you worked onboard a [ship type]?
- - How long have you worked onboard this vessel?

2. Can you tell me about the manner in which you're currently employed, such as your contract type, trip length and so on?
   - - Do you have a permanent or a voyage contract?
   - - How long is your trip?
   - - How long is your leave?
   - - Do you do any employment during your leave?
3. Can you tell me about crew change-over such as the size of crew-change over and frequency of crew change-overs?
   - - How many crew change-over at once?
   - - How often do crew changes occur?
   - - How often does on time relief occur?
   - - How do you feel about not getting relieved on time?
   - - Do you work back-to-back / do you return to the same vessel?
4. Can you tell me about your normal hours of work onboard?
   - - Which watch pattern are you working?
   - - How do the hours you work change within an entire trip?
   - - When during a trip do you work more hours?
   - - When during a trip do you work less hours?
5. Can you tell me about fatigue during a trip?
   - - When are you particularly tired?
   - - Why are you particularly tired then?
   - - How do you identify periods when you're particularly tired?
   - - How does fatigue relate to your working practices?
   - - Can you give me an example of how your working practices are affected by fatigue?
6. Can you tell me about the process from leaving home until joining this vessel?

- - How much notice did you get? Is this standard?
- - How long did it take to get to the airport?
- - How long was your flight?
- - What happened when you arrived at the destination airport?
- - What was the time zone difference?
- - How long did you spend in a hotel?
- - How long did you travel to the ship from the airport?

7. Next can you tell me about the process you experienced once you joined the vessel?
   - - Can you tell me about your familiarisation tour?
   - - Can you tell me about the handover you experienced?
   - - Were you already familiar with the other seafarers onboard?
   - - When did you begin work?
8. Finally, thinking back can you describe the process you experienced when you signed off your last vessel?
   - Can you tell me about the handover?
   - Can you tell me about your final few days of work?

   - How soon after finishing work did you leave the ship?

**Risks**

9. What do you think are the greatest risks faced by yourself onboard?

- - Why do you think these are the most significant risks?
- - Can you give me an example of how you experience these risks?

10. How do you think risks vary depending on your position onboard?

- - Why do you think this?
- - What do you think is the riskiest part of your particular job onboard?
- - Can you give me an example of why you think this is particularly risky?

11. What do you think are the greatest barriers to addressing the risks you've mentioned?

- - What makes you think of these issues as barriers?
- - How do you try to overcome these barriers?

12. Can you tell me how you think these risks vary might vary?

- - How do you think these risks vary with time of the day?
- - How do you think these risks vary with experience?

13. How do you think the SMS addresses these risks?

- - What do you particularly like about the SMS?
- - What do you dislike about the SMS?
- - How confident do you feel using the SMS?
- - What would you change about the SMS?

14. How do the ways the SMS address the risks work in practice?

- Can you give me an example of when you haven't followed the SMS procedures?

(If no: can you give an example of when a colleague hasn't followed the SMS procedure?)

- Can you explain why you didn't follow the SMS procedure?

## Time

15. What is your favourite watch to work?
- Why do you particularly like the X to Y watch?

16. What is your least favourite watch to work?
- Why do you particularly dislike the A to B watch?

17. How do you think risk differs between the different watches?

- - What do you think is the riskiest watch?
- - What do you think is the safest watch?
- - Why do you think this?

18. How do you think risk differs between different watch patterns?

- - What do you think is the riskiest watch pattern?
- - What do you think is the safest watch pattern?
- - Could you tell me more about your thinking on this?

19. When within your X weeks/months trip are you today?

- - It's interesting that you say you're X days/ weeks in rather than X days/ weeks from the end, when within a trip would you say that you were X days/ weeks from the end of your trip? (or vice versa)

- - What makes you choose this particular period of time?
- - How do you think this would vary depending on the length of trip you're working?
- - Why do you think this?

20. Do you think risks vary within the X weeks/months you are onboard?

- Can you explain why you think this?

21. When do you think the riskier times within the X weeks/months you are onboard?

- - Why do you think these times are more risky?
- - Can you give me an example?

22. Do you think the SMS takes account of these times?

- - If so, how?
- - If not, what could be done differently?
- - How are these issues taken into account unofficially onboard?

23. Do your working practices differ at different times during your trip?

- - Can you tell me more about how your working practices might differ?
- - How do these times of working practice differences relate to periods of time you view as particularly risky?

23. What period of time would you consider to be the start of your trip?

- - Why do you view this particular period as the start?
- - How does this vary with the length of your trip?

24. What period of time would you consider to be the end of your trip? - Why do you view this particular period as the end?
- How does this vary with the length of your trip?

**Injuries at sea**

25. What factors would affect whether or not you reported an injury?

- - What are your reasons for identifying these particular factors?
- - How would the period of time into your trip affect whether or not you reported an injury?
- - What makes you say this?

26. Can you tell me about the most recent injury have you experienced onboard? (If no: what about an injury that you didn't report/ can you tell me about an occasion when you hurt yourself but didn't feel it warranted reporting?)
    - - What were the events leading up to the injury?
    - - Can you tell me more about why you think the incident happened?
    - - What particularly stands out in your mind about the incident?
    - - Can you recall how you felt after the incident?
27. Can you tell me what happened when you reported the injury? (If didn't report it: why did you choose not to report the injury? Did anyone else witness the event? How did you feel about not reporting the injury?)
    - - How did the Captain react when you reported the injury?
    - - How do you feel the injury report was handled by shoreside?
    - - What makes you say that?
    - - If you experienced a similar incident in the future would you do anything differently?
    - - Can you tell me more about your thinking on that?
28. How does when this incident occurred within your trip relate to your ideas regarding risky times?
29. What else do you think is relevant that we haven't discussed?

## APPENDIX II: INJURY CLASSIFICATIONS

| | |
|---|---|
| **Fatality** | A death directly resulting from a work injury regardless of the length of time between the injury and death. |
| **Lost workday case** | This is an injury which results in an individual being unable to carry out any of his duties or to return to work on a scheduled work shift on the day following the injury unless caused by delays in getting medical treatment ashore. Note: An injury is classified as an LWC if the individual is discharged from the ship for medical treatment. |
| **Restricted work case** | This is an injury which results in an individual being unable to perform all normally assigned work functions during a scheduled work shift or being assigned to another job on a temporary or permanent basis on the day following the injury. |

| | |
|---|---|
| **Medical treatment case** | This is any work-related loss of consciousness, injury or illness requiring more than first aid treatment by a physician, dentist, surgeon or registered medical personnel, e.g. nurse or paramedic under the standing orders of a physician, or under the specific orders of a physician or if at sea with no physician onboard could be considered as being in the province of a physician. |
| **First aid case** | This is any one-time treatment and subsequent observation or minor injuries such as bruises, scratches, cuts, burns, splinters etc. The first aid may or may not be administered by a physician or registered professional. |

Incident classification adapted from OCIMF 1997 [online].

## APPENDIX III: RESEARCH PARTICIPANT DISCLAIMER

[NAME and OCCUPATION]

**RESEARCH PARTICIPANT DISCLAIMER**

Research conducted by: **[name and email]**

Supervisors: [names and university]

**DISCLAIMER FOR COLLECTION OF COMPANY ACCIDENT DATA**

I am willing to provide data to be used for this research as follows:

For seafarers who experienced an occupational accident:
• date the seafarer joined the ship, date the seafarer experienced the accident,
• type of occupational accident (restricted work accident/lost time incident/medical treatment case),
• date the seafarer expected to leave the ship (end of planned contract),
• date the seafarer left the ship,
• ship name (to be used to ascertain ship type)

For each ship on which a seafarer experienced an occupational accident:
• total number of seafarers onboard at the time
• total number of seafarers from this group that over-stayed their planned contract end

I have been informed that all information I give will remain confidential and all participants will remain anonymous. Any details which may compromise this anonymity will be removed or masked as appropriate. No company identifiable data will be used at all during the work.

I understand that the data will be stored securely throughout the period of research and also for a period of five years following the completion of the research as per the [name of] University guidelines. I understand that access to the data will be restricted to [name] and [name] supervisor.

I have been informed that the data I give will be used for research. The data will appear in a thesis and may be published in the form of journal articles, books or used as training material.

I understand that I have the right to withdraw my consent for the use of any data provided at any time and that the partaking in this research is voluntary.

Signature of participant

Signature of participant

Name Date
Name Date

Copies: participant

Research file

## APPENDIX IV: INFORMATION SHEET FOR SEAFARERS

[name and occupation]

### Research project:

Dear prospective participant,

You are being invited to participate in the above-stated project and before you decide if you wish to participate it is important you understand what the project will involve and why it is being carried out.

**What is this project about?**

The overall aim of this project is to contribute to the understanding of the ways in which different time periods within a voyage affect seafarers from different sectors of the seafaring industry.

**Who is doing the project?**

This research is being carried out by [name] who is completing a [degree] at the [name] University. [name] is being supervised by Professor [name]…

**Why have I been chosen?**

[name] is looking to speak to seafarers who sail onboard either deep-sea tankers or offshore vessels in order to explore how these seafarers experience and perceive risk at different periods of time within a voyage.

**What will I have to do?**

You will be invited to participate in a conversation with [name] which will take around one hour and with your permission this conversation will be digitally recorded so that all the things that are said in the discussion will be remembered.

**What kind of things will be discussed?**

During the conversation you will be asked about how you perceive risk at different periods of time within a voyage and your experiences of personal injuries at sea. You are free to say as much or as little as you want and of course you can withdraw from the conversation at any time without having to give a reason.

**What will be done with the information I give?**

Following the conversation [name] will play back the audio recording and type the discussion exactly as it happened. This information will then be analysed and used as part of the thesis. Some of the information may also be used in journals and books, however, it will not be used for any other reason.

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**Will the information I give be kept confidential?**

When typing up the conversation all identifying details will be removed and these identifying details will only be accessible by [name] and her supervisor. Your name will not feature on either the digital recording or the typed version and you will remain anonymous. The recording and typed version of the conversation will be stored in a secure location at [location].

**What if I am concerned about the conduct of the research?**

This project is being conducted with the approval of the [name] University. If at any point you are concerned about any aspect of this project please contact the chair of the committee at the following address:

[address of the university]

**How can I contact you?**

If you would like any further information about this project please contact [name] at either the following postal address or email address:

[address]
Email:

Thank you for taking the time to read this information and it would be a pleasure to have you participate in this project.

## APPENDIX V: INTERVIEW PARTICIPANT CONSENT FORM

[name and occupation]

**RESEARCH CONSENT FORM**

Research conducted by: [**name]**

## CONSENT FOR PARTICIPATION IN INTERVIEW

1. I am confirm they I have read the attached participant information document and that I understand the contents of it.
2. I have been informed that all information I give will remain confidential and my participation will remain anonymous. Any details which may compromise this anonymity will be removed or masked as appropriate.
3. I understand that the data will be stored securely throughout the period of research and also for a period of five years following the completion of the research as per the [name] University guidelines. I understand that access to the data will be restricted to [name] and [name] supervisors.
4. I have been informed that the data I give will be used for research. The data will appear in a thesis and may be published in the form of journal articles, books or used as training material.
5. I understand that I have the right to withdraw my consent for the use of any data provided at any time and that the partaking in this research is voluntary.

Signature of participant

Name
Date

Copies: participant

Research file

## APPENDIX VI: INDEPENDENT VARIABLES ANALYSIS

| Rank | Company A | Company B |
|---|---|---|
| Officer | 52 (39.1%) | 120 (34.7%) |
| Rating | 76 (57.1%) | 208 (60.1%) |
| Other | 5 (3.8%) | 18 (5.2%) |

| Injury type | Company A | Company B |
|---|---|---|
| Break/fracture | 14 (10.6%) | 22 (6.2%) |
| Sprain/strain | 22 (16.7%) | 52 (14.6%) |
| Laceration/open wound | 52 (39.4%) | 103 (29.0%) |
| Burn/scald | 9 (6.8%) | 15 (4.2%) |
| Bruise | 20 (15.2%) | 56 (15.8%) |
| Other | 15 (11.4%) | 107 (30.1%) |

| Location where injury occurred | Company A | Company B |
|---|---|---|
| Deck | 58 (43.6%) | 156 (40.0%) |
| Engine room | 39 (29.3%) | 125 (32.1%) |
| Accommodation block | 32 (24.1%) | 88 (22.6%) |
| Other | 4 (3.0%) | 21 (5.4%) |

| Part of body injured | Company A | Company B |
|---|---|---|
| Arm | 55 (41.4%) | 144 (38.6%) |
| Leg | 29 (21.8%) | 77 (20.6%) |
| Torso | 11 (8.3%) | 65 (17.4%) |
| Head | 35 (26.3%) | 84 (22.5%) |
| Other | 3 (2.3%) | 3 (0.8%) |

| Department | Company A | Company B |
|---|---|---|
| Engine | 37 (32.2%) | 82 (24.6%) |
| Deck | 58 (50.4%) | 97 (29.1%) |
| Other | 20 (17.4%) | 154 (46.2%) |

## APPENDIX VII: INTERVIEW PARTICIPANTS

| Position onboard | Department | Nationality | Age |
|---|---|---|---|
| | **Ship 1** | | |
| Bosun | Deck | British | 37 |
| Third Engineer | Engine | British | 29 |
| Chief Steward | Other | Polish | 46 |
| AB 1 | Deck | Romanian | 44 |
| AB 2 | Deck | Romanian | 51 |
| Second Officer | Deck | Polish | 27 |
| First Officer | Deck | Polish | 28 |
| Storekeeper | Other | Norwegian | 62 |
| Administrator | Other | Filipino | 42 |
| Steward | Other | Filipino | 41 |
| | **Ship 2** | | |
| Second Engineer | Engine | British | 27 |
| Chief Engineer | Engine | British | 55 |
| Captain | Deck | British | 53 |
| Deck Cadet 1 | Deck | British | 20 |
| Deck Cadet 2 | Deck | British | 21 |
| Fourth Engineer | Engine | British | 23 |
| Third Engineer | Engine | British | 29 |
| Deck Cadet 3 | Deck | British | 20 |
| Third Officer | Deck | British | 29 |
| AB 1 | Deck | British | 52 |
| Second Officer | Deck | British | 23 |
| AB 2 | Deck | British | 51 |
| | **Ship 3** | | |
| Third Engineer | Engine | Filipino | 43 |
| Chief Engineer | Engine | Swedish | 39 |
| Second Officer | Deck | Swedish | 54 |
| Chief Officer | Deck | Swedish | 39 |
| Captain | Deck | Swedish | 54 |
| OS | Deck | Filipino | 31 |
| Wiper | Engine | Filipino | 34 |
| | **Ship 4** | | |
| Captain | Deck | Dutch | 57 |
| Chief Officer | Deck | Filipino | 52 |
| Chief Engineer | Engine | Polish | 45 |
| Cook | Other | Polish | 49 |
| Third Officer | Deck | Russian | 25 |
| AB | Deck | Filipino | 42 |
| Second Engineer | Engine | Filipino | 43 |
| Second Officer | Deck | Russian | 30 |