



Quench

Hydration Campaign

In partnership with:





Contents

	<u>Page</u>
Introduction to the Campaign	4
Background to NAKILAT	5
Method and limitations of pilot campaign	6
Method	6
Statistical Method	6
Limitations	8
Results	8
Experimental Ship Results	10
Experimental Ship: Drink Type	12
Experimental Ship: Quiz Results	12
Ship 2 Results	12
Ship 2: Drink Type	14
Ship 2: Quiz Results	14
Ship 3 Results	15
Ship 3: Drink Type	16
Ship 3: Quiz Results	17
Ship 4 Results	17
Ship 4: Drink Type	18
Ship 4: Quiz Results	19
Conclusion	19



List of Figures

	<u>Page</u>
Fig. 1: Page from personal log-book	6
Fig. 2: Estimates for fixed effects in statistical analysis	7
Fig. 3: Hypothesis tests to determine whether there was a difference between ships	7
Fig. 4: Average total water consumption over time on each ship	9
Fig. 5: Comparison of day 1 and day 28 results for each ship	9
Fig. 6: Average individual water consumption on experimental ship	10
Fig. 7: Model-predicted average water intake vs recorded intake on experimental ship	11
Fig. 8: Fluid intake by drink type on experimental ship	12
Fig. 9: Average individual water consumption on ship 2	12
Fig. 10: Model-predicted average water intake vs recorded intake on ship 2	13
Fig. 11: Fluid intake by drink type on ship 2	14
Fig. 12: Average individual water consumption on ship 3	15
Fig. 13: Model-predicted average water intake vs recorded intake on ship 3	16
Fig. 14: Fluid intake by drink type on ship 3	16
Fig. 15: Average individual water consumption on ship 4	17
Fig. 16: Model-predicted average water intake vs recorded intake on ship 4	18
Fig. 17: Fluid intake by drink type on ship 4	18



Hydration Campaign Observations and Findings

This report gives an overview of the International Seafarers' Welfare and Assistance Network's (ISWAN) pilot Hydration Campaign which went ahead over a 28-day period in Spring/Summer 2017. It discusses the campaign's findings and considers recommendations for future work on promoting the importance of hydration to seafarers on board. As is the case with all health promotion on board ships, both seafarers and shipping companies are integral to successfully improving health. It is hoped this report will help to encourage other shipping companies to promote the importance of hydration to their seafarers.

ISWAN would like to thank Nakilat for their participation in this campaign and all of their assistance with co-ordinating the campaign materials, as well as the seafarers who gave up their time to be part of this pilot. We'd also like to thank Georgina Robinson who designed the campaign and all of the important materials to inform seafarers about hydration.

Introduction to the Campaign

ISWAN has a long history of working to improve the health of seafarers, first through its predecessor the International Committee on Seafarers Welfare (ICSW), which initiated the long-running Seafarers' Health Information Programme (SHIP). In order to ensure health resources remain useful and relevant to seafarers, ISWAN has been committed to investigating other areas where improvements in knowledge may help seafarers to make healthier life choices. One such area is knowledge about the importance of hydration and the negative impacts of dehydration on health.



Working on board can present seafarers with factors that may make it challenging to remain adequately hydrated. Some job roles are physically demanding and, for Engineers especially, working in very hot environments can be common. A possible lack of fresh fruit and vegetables (a good source of water), and distrust of water on board because of taste or appearance can put seafarers at risk of dehydration. Some anecdotal evidence also suggests that the inconvenience of taking a toilet break due to workload or distance to the toilet can mean that seafarers consciously decide to drink less.

At present little research exists on the hydration of seafarers, but experiences of those who have been to sea, or who work to support seafarers, suggest that dehydration at sea can be common. There are also fairly high instances of diseases among seafarers which can be linked to, and caused – or made worse – by dehydration. Therefore, an encouragement for seafarers to consume more liquids is helpful to their general health and to productive work on board.



In order to investigate this area further, ISWAN worked with Cognitive Behavioural Therapist Georgina Robinson to design a pilot campaign to:

1. Provide seafarers with the right tools and information to encourage them to stay hydrated on board
2. Gather data on the drink types and volume consumed by seafarers on board over a 28-day period
3. Attempt to draw conclusions about the effectiveness of certain campaign materials

The campaign went ahead on four Nakilat LNG tankers with a total of 73 seafarer participants who recorded everything they drank for 28 days. At the end of the campaign, participants took a quiz to assess their basic knowledge of hydration.

Results showed that overall, seafarers on all four vessels recorded seemingly adequate levels of water intake with more than half of the participants recording an average increase in water consumption over the course of the campaign. More detailed analysis of results is discussed below.

Background to NAKILAT

Established in 2004, Nakilat is a Qatari-owned shipping and maritime company providing the critical transportation link in the State of Qatar's LNG supply chain. The company's LNG shipping fleet is the largest in the world, comprising of 65 LNG vessels. Nakilat also owns one FSRU vessel and four large LPG carriers, with the latter operated by its in-house ship management arm, Nakilat Shipping Qatar Limited (NSQL). In addition to its core shipping activities, Nakilat operates the ship repair and construction facilities at Erhama Bin Jaber Al Jalahma Shipyard in Ras Laffan Industrial City via two strategic joint ventures: Nakilat-Keppel Offshore & Marine (N-KOM) and Nakilat Damen Shipyards Qatar (NDSQ). It also provides shipping agency services through Nakilat Agency Company (NAC) at all Qatari ports and terminals, as well as towage and other marine support services through its joint venture Nakilat SvitzerWijsmuller (NSW) for vessels at the Port of Ras Laffan and around Qatar's Halul Island. Nakilat's comprehensive business portfolio of shipping and maritime services complements its vision to be a global leader and provider of choice for energy transportation and maritime services.

Qatar's summer climate is very hot and humid with summer temperatures ranging between 30-50 degrees Celsius and an average humidity level of 25-75%. This kind of climate creates a potentially challenging situation for our seafarers who may be exposed to these conditions whilst loading in Ras Laffan. Therefore, our company is very focused on Heat Stress Management and hydration is an important factor in our programme. Our seafarers are encouraged to know the major symptoms of heat stress and to drink plenty of water at regular intervals as a good practice to minimize the risks.

As members of ISWAN since July 2015, we were delighted to be invited to participate in the Quench Hydration Project as we believed that we could add value to the process through our wealth of experience. We are also planning to introduce ISWAN's Seafarers' Health Information Programme (SHIP) across our fleet in the coming months.



Method and limitations of pilot campaign

Method

The campaign took place on four LNG Tankers. Seafarers on all four ships were given a ‘hydration pack’ which included instructions about the campaign with participation consent form, an information sheet on the importance of hydration, a personal log-book (fig. 1) and hydration quiz.

Fig. 1: Page from personal log-book

Quench Hydration – Daily Log Sheet Day 1

How much	Less than 6 fluid ounces or ¼ cup	8 + fluid ounces or 1 cup	12 + fluid ounces or 1 ½ cups	16 + fluid ounces or 2 cups	20 + fluid ounces or 2 ½ cups
Bottled Water	1-2	1-2	1-2	1-2	1-2
How Often today?	3-4	3-4	3-4	3-4	3-4
	5-6	5-6	5-6	5-6	5-6
	7+	7+	7+	7+	7+
Ships Water	1-2	1-2	1-2	1-2	1-2
How Often today?	3-4	3-4	3-4	3-4	3-4
	5-6	5-6	5-6	5-6	5-6
	7+	7+	7+	7+	7+
Coffee	1-2	1-2	1-2	1-2	1-2
How Often today?	3-4	3-4	3-4	3-4	3-4
	5-6	5-6	5-6	5-6	5-6
	7+	7+	7+	7+	7+
Tea	1-2	1-2	1-2	1-2	1-2
How Often today?	3-4	3-4	3-4	3-4	3-4
	5-6	5-6	5-6	5-6	5-6
	7+	7+	7+	7+	7+
Fruit Tea	1-2	1-2	1-2	1-2	1-2
How Often today?	3-4	3-4	3-4	3-4	3-4
	5-6	5-6	5-6	5-6	5-6
	7+	7+	7+	7+	7+
Flavoured Juice	1-2	1-2	1-2	1-2	1-2
How Often today?	3-4	3-4	3-4	3-4	3-4
	5-6	5-6	5-6	5-6	5-6
	7+	7+	7+	7+	7+
Fizzy Drinks	1-2	1-2	1-2	1-2	1-2
How Often today?	3-4	3-4	3-4	3-4	3-4
	5-6	5-6	5-6	5-6	5-6
	7+	7+	7+	7+	7+
Soda	1-2	1-2	1-2	1-2	1-2
How Often today?	3-4	3-4	3-4	3-4	3-4
	5-6	5-6	5-6	5-6	5-6
	7+	7+	7+	7+	7+
Vegetable Juice	1-2	1-2	1-2	1-2	1-2
How Often today?	3-4	3-4	3-4	3-4	3-4
	5-6	5-6	5-6	5-6	5-6
	7+	7+	7+	7+	7+

Participants were asked to record everything they drank, on a daily basis, for 28 days and to complete the multiple-choice hydration quiz after the final day. All fluid consumption was recorded in US fluid ounces and each measurement included a symbol of a drinking vessel – such as a can or bottle – to help demonstrate a particular measure to participants.

In order to encourage as many seafarers as possible to join the campaign, participants were not required to submit any personal information such as name, age or job role. Instead, each participant was assigned a unique identification number which was noted on their log books. Phone numbers were requested so that participants could be sent routine reminders about completing their log books. As an incentive to join the campaign, participating seafarers were entered into a prize draw to win an iPad.

One ship was designated the ‘experimental ship’ which was the only ship to display a number of different materials about hydration throughout the campaign (the materials can be viewed [here](#)). Materials included posters with information about the importance of remaining hydrated and stickers which were strategically placed in and nearby areas where refreshments are stored and/or consumed as a way to remind seafarers to drink. In addition, every toilet on the experimental ship displayed a urine colour chart to help participants judge whether they may need to drink more water. None of these materials were present on the three other ships to see if any notable comparisons could be made between the water intake of participants on the experimental ship and the non-experimental ships, and to assess the effectiveness of the materials.

Statistical Method

The data were analysed using a Linear Mixed Model which takes into account the inherent correlation between measurements on the same individual. The ‘Mixed’ comes from the fact that both fixed and random effects are added to the model. Fixed effects are global effects; random effects vary across subjects.

As water was by far the highest consumption of all the liquids consumed, the statistical analysis was done on water consumption alone, not on total liquid consumption.

The two fixed effects included in the model were ship and a ship*time interaction term. The ship parameter is simply the intercept (average water intake) for each ship and the interaction term describes how the water intake changes over time across ships.

Due to the large variation in baseline values for total daily water intake, a random intercept was included in the model. This assigns each subject its own intercept; a deviation from the mean intercept that persists over time. A random time slope was also included in the model as there was a noticeable difference in trends between individuals.

The estimates for the fixed effects are shown in figure 2. The significance of the ship effects can be ignored as this just indicates that the ship averages are significantly different from 0. It can be seen that, for ships 3 and 4, there is an increase over time that is significant at the 5% level; Day 3 has an estimate of 0.6589 ($p=0.0180$) and Day 4 has a parameter estimate of 1.1921 ($p=0.0087$). The slopes for the experimental ship and ship 2 were not significantly different from 0.

Fig. 2: Estimates for fixed effects in statistical analysis

Effect	ship	Estimate	Standard Error	DF	t Value	Pr > t
ship	Experimental	62.1210	10.4074	69	5.97	<.0001
ship	2	90.9398	8.9332	69	10.18	<.0001
ship	3	67.7794	7.2311	69	9.37	<.0001
ship	4	65.4919	11.7442	69.1	5.58	<.0001
DAY*ship	Experimental	0.4856	0.3916	69.1	1.24	0.2191
DAY*ship	2	0.1690	0.3360	69	0.50	0.6164
DAY*ship	3	0.6589	0.2719	69	2.42	0.0180
DAY*ship	4	1.1921	0.4418	69.2	2.70	0.0087

Figure 3 shows hypothesis tests that were carried out to see if there was a difference between ships. It can be seen that the differences between ships are not significantly different from 0; the increase in water intake over time is similar across the ships.

Fig. 3: Hypothesis tests to determine whether there was a difference between ships

Test	Estimate	Standard Error	DF	t Value	Pr > t
Ship 2 – Experimental	-0.3166	0.5160	69.1	-0.61	0.5415
Ship 3 – Experimental	0.1733	0.4768	69.1	0.36	0.7174
Ship 4 – Experimental	0.7065	0.5904	69.2	1.20	0.2355

There was a moderate negative correlation (-0.37) between the random intercept and random slope parameters which suggests that subjects that had a higher intake at the start of the study had a smaller increase over time than those subjects with a lower daily water intake.

Limitations

There are some limitations that should be noted:

1. There are no other known studies about the drinking habits of seafarers that the findings from this campaign can be compared with
2. The campaign was co-ordinated remotely, with one company only. In providing anonymity, the specific job functions and ranks of the respondents are unknown
3. It is impossible to determine an individual's water requirements without knowledge of their metabolism, physical activity, health status and other environmental factors. Therefore the data gathered as part of this campaign cannot draw conclusions about whether the water intake recorded by seafarers met their individual requirements during this period. Seafarers participating in the campaign were given a general guideline that they should attempt to consume around 2 litres (68 US fl oz) of water during a fairly sedentary day, so any comments in the results relate to that guidance
4. The results were reliant on participants recording their fluid intake accurately
5. The participating shipping company – Nakilat – was already committed to raising awareness of the importance of hydration among their crew before the campaign began and some of their previous company campaign materials were still present on all ships. This meant it was difficult to draw conclusions about the effectiveness of the campaign-specific materials on the experimental ship
6. Although there is nothing to suggest that any aspect of the campaign was misunderstood by participants, all campaign materials were produced in English and many participants will speak English as a second language

Results

The units of measurement for liquid consumption were US fluid ounces (fl oz). In the results, comparisons are made with litres (given the advice to drink around 2 litres of water during a fairly sedentary day). One litre is the equivalent of 34 fl oz.

There were a total of 73 seafarers participating in the Hydration Campaign for the entire 28 days across all four ships. As shown in figures 4 and 5, all ships recorded an average increase in the total volume of water consumed during this time but in some cases, extremely high (> 4 litres / 135 fl oz) and extremely low (<1 litre / 34 fl oz) daily intakes were recorded by individuals.

Despite the presence of additional campaign materials on the experimental ship, we did not see the largest increase in water consumption on this ship.

Choice of drink did not vary greatly, with water being the top choice on all four ships and some slight variance in the popularity of coffee, tea, fruit juice and soda.

Fig. 4: Average total water consumption over time on each ship

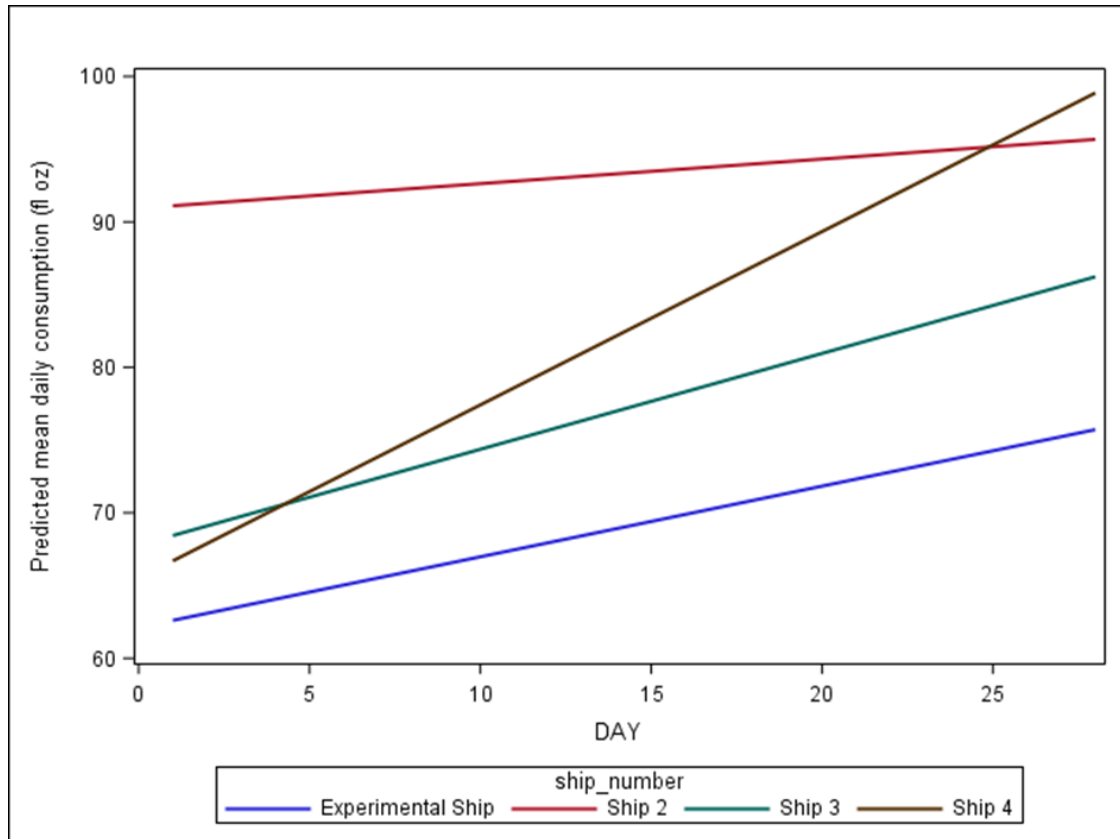
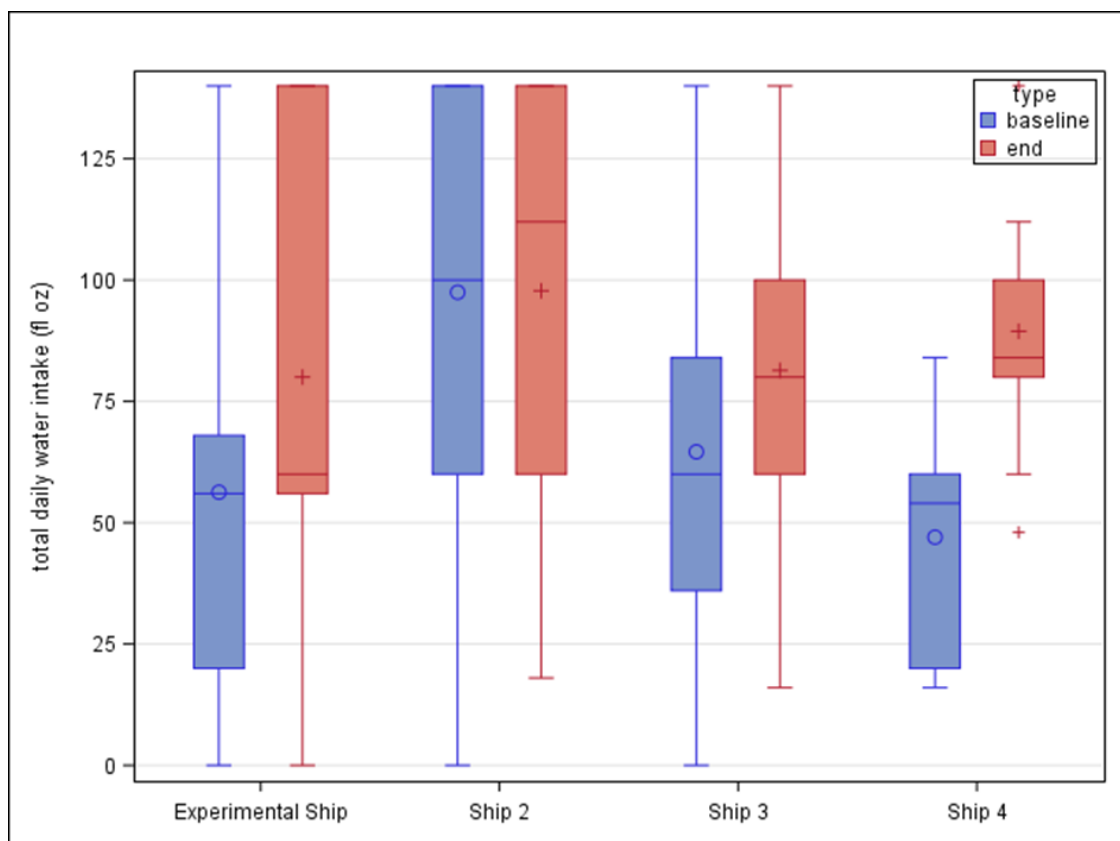


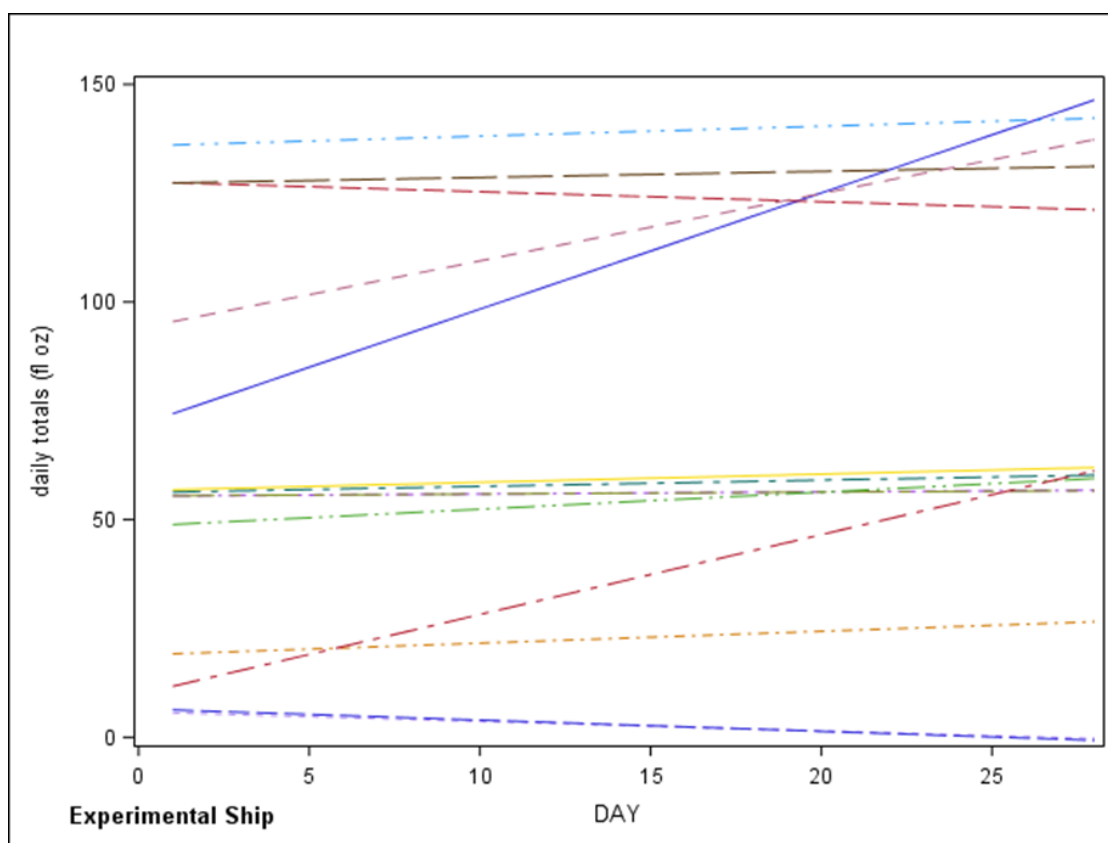
Fig. 5: Comparison of day 1 and day 28 results for each ship



The end of campaign quiz results showed a good level of awareness about the importance of hydration generally. However, 12/73 participants (16%) thought you could survive for a month without water. Most of these participants (9/12) consistently recorded the lowest water intake of all seafarers taking part: five of these participants recorded a consumption of < 68 fl oz (2 litres) per day for more than half of the campaign; two recorded a consumption of < 34 fl oz (1 litre) for most of the campaign and two participants recorded next to no water consumption on two or more days of the campaign. Interestingly, the ship which recorded the largest average increase in water intake over the course of campaign (ship 4) had the highest average quiz score of all ships. Participants on this ship also recorded the lowest average intake on day 1 of the campaign (50 fl oz).

Experimental Ship Results

Fig. 6: Average individual water consumption on experimental ship

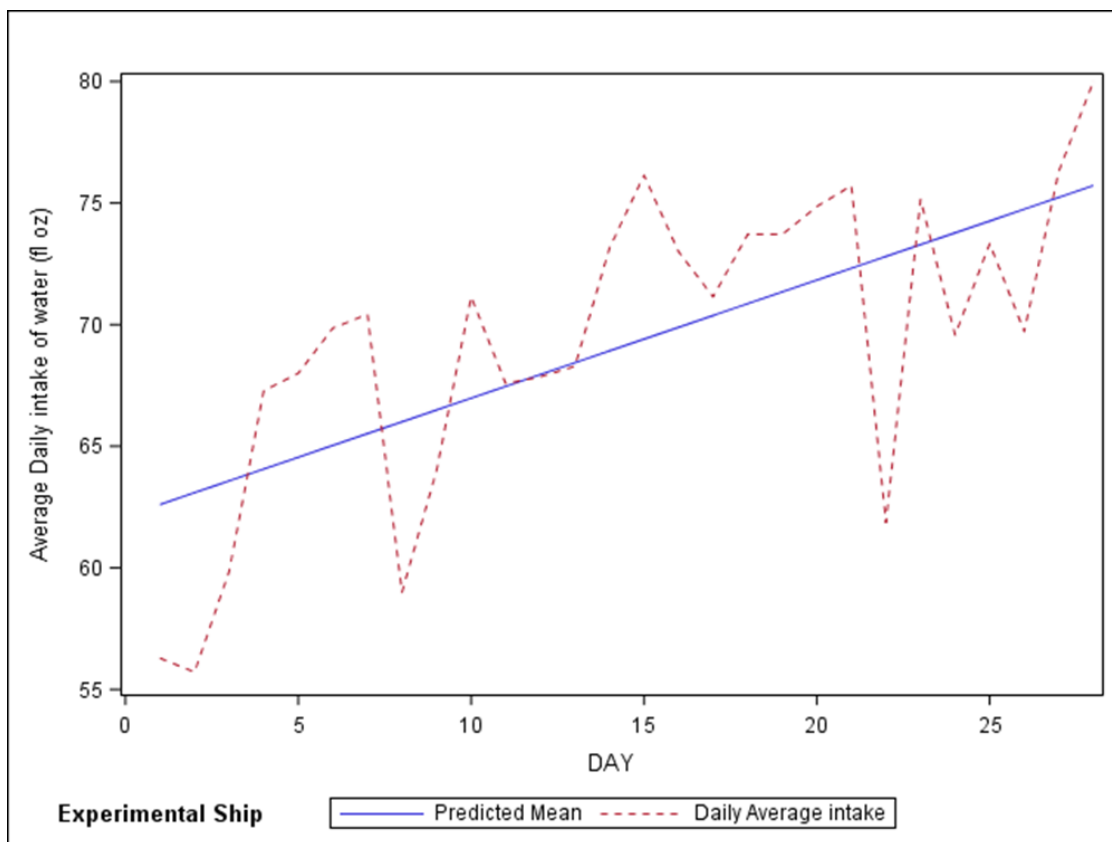


There were a total of 14 seafarers participating on the experimental ship. Almost half of the participants on this ship (6/14) recorded an average increase to their water intake over the duration of the campaign, five recorded a decrease in intake and three consistently recorded the same intake throughout. As figure 6 shows, three of the participants who recorded a decrease in intake throughout the campaign actually recorded fairly high levels of water intake from the beginning, and their average intake remained just above 2 litres per day. However, two participants recorded exceptionally low intakes averaging under 10 fl oz (300 ml) throughout the campaign.

The average intake recorded by the experimental ship participants on day one of this campaign was just under 60 fluid ounces (1.8 litres) which, depending on a seafarer’s individual water requirements, could be considered inadequate. In addition, more than 50% of participants on this ship recorded an average intake of less than 60 fl oz throughout the campaign.

Figure 7 shows a general upward trend over the 28 days but also two periods during the campaign where average intake dropped. This is mostly due to the individuals mentioned above who recorded very low levels of consumption.

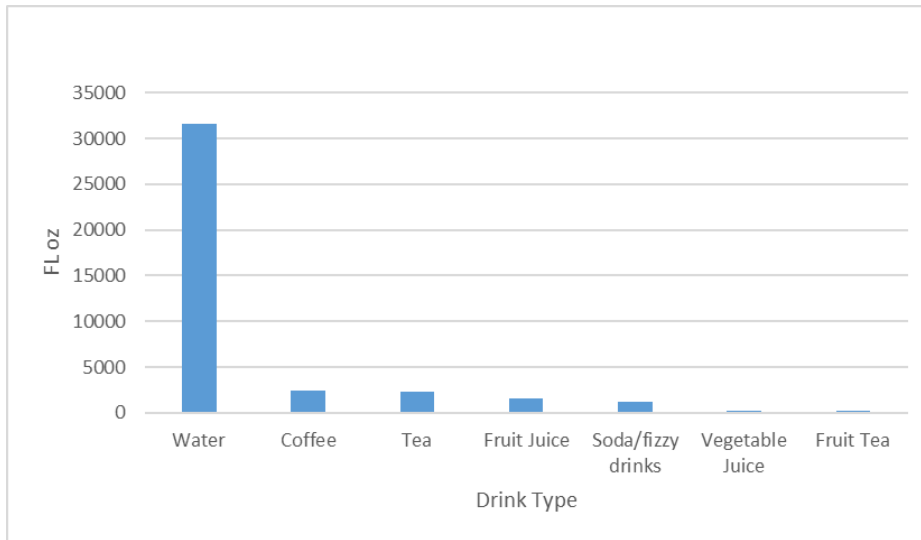
Fig. 7: Model-predicted average water intake vs recorded intake on experimental ship



Experimental Ship: Drink Type

As with all other ships, water was the top choice of participants on the experimental ship (fig. 8).

Fig. 8: Fluid intake by drink type on experimental ship

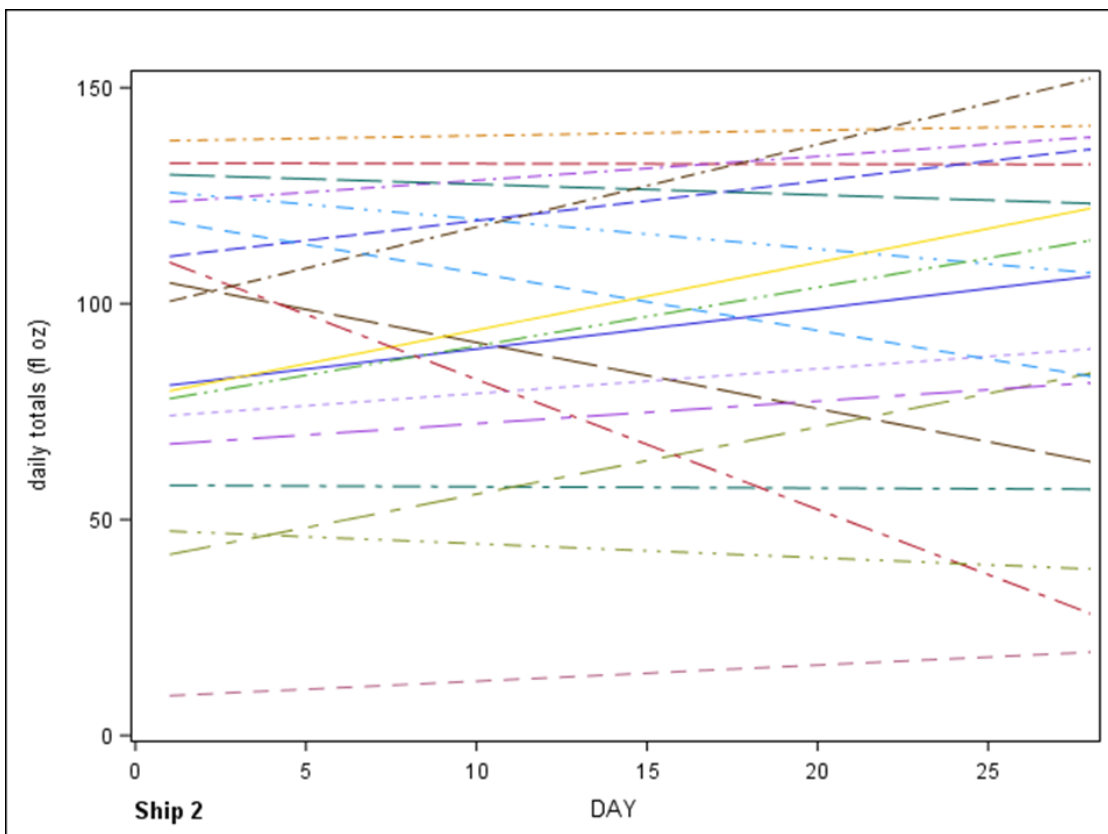


Experimental Ship: Quiz Results

Participants on the experimental ship scored an average of 81% in the end of campaign quiz. However, 3/14 participants thought you could survive for a month without water.

Ship 2 Results

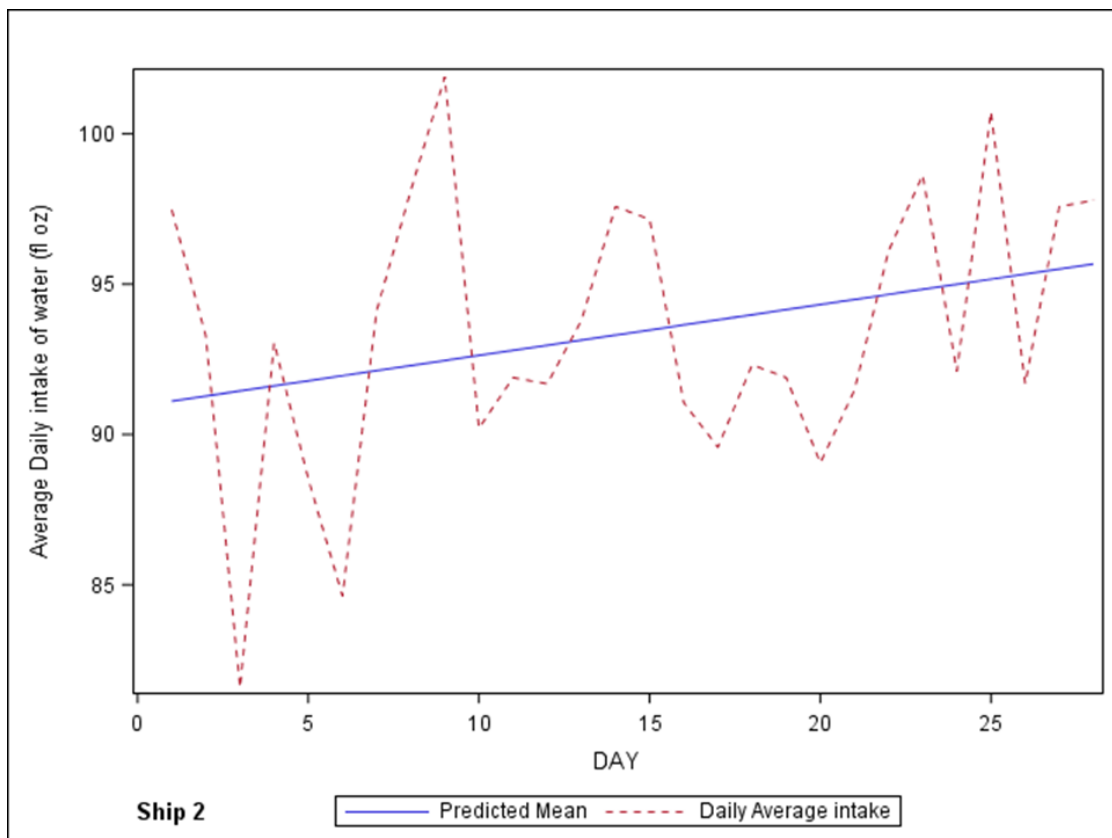
Fig. 9: Average individual water consumption on ship 2



As shown in figure 9, there were 20 seafarers participating on ship 2; 11 participants who recorded an average increase in water intake over the 28 day period and nine who recorded a decrease. In contrast with the experimental ship, over half of the participants recorded an average of 68 fl oz (2 litres) or more throughout the campaign, with three participants recording extremely low volumes of water consumption throughout. Although this ship did not record the largest increase in water intake, on day 1 of the campaign, individuals recorded an average intake of 97 fl oz (2.8 litres), the highest of all ships. Depending on different individual requirements, it's likely that a large increase in water intake would be unnecessary for many of them. Although figure 10 shows some dips in average recorded consumption of participants, after day 6 participants recorded an average of over 90 fl oz for the remainder of the campaign.

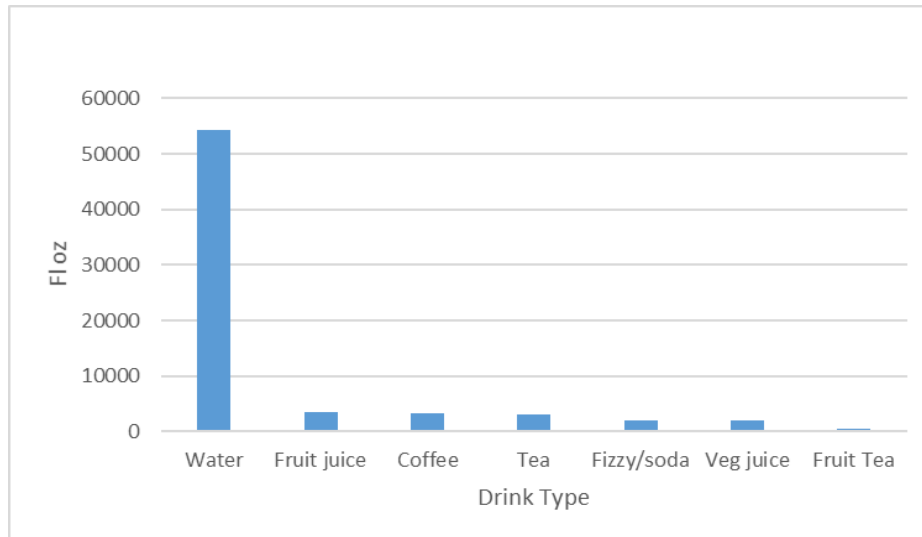
On ship 2, there were only four participants (20%) who consistently recorded water consumptions of under 68 fl oz (2 litres) per day compared with the experimental ship where 50% of participants recorded similarly low volumes.

Fig. 10: Model-predicted average water intake vs recorded intake on ship 2



Ship 2: Drink Type

Fig. 11: Fluid intake by drink type on ship 2



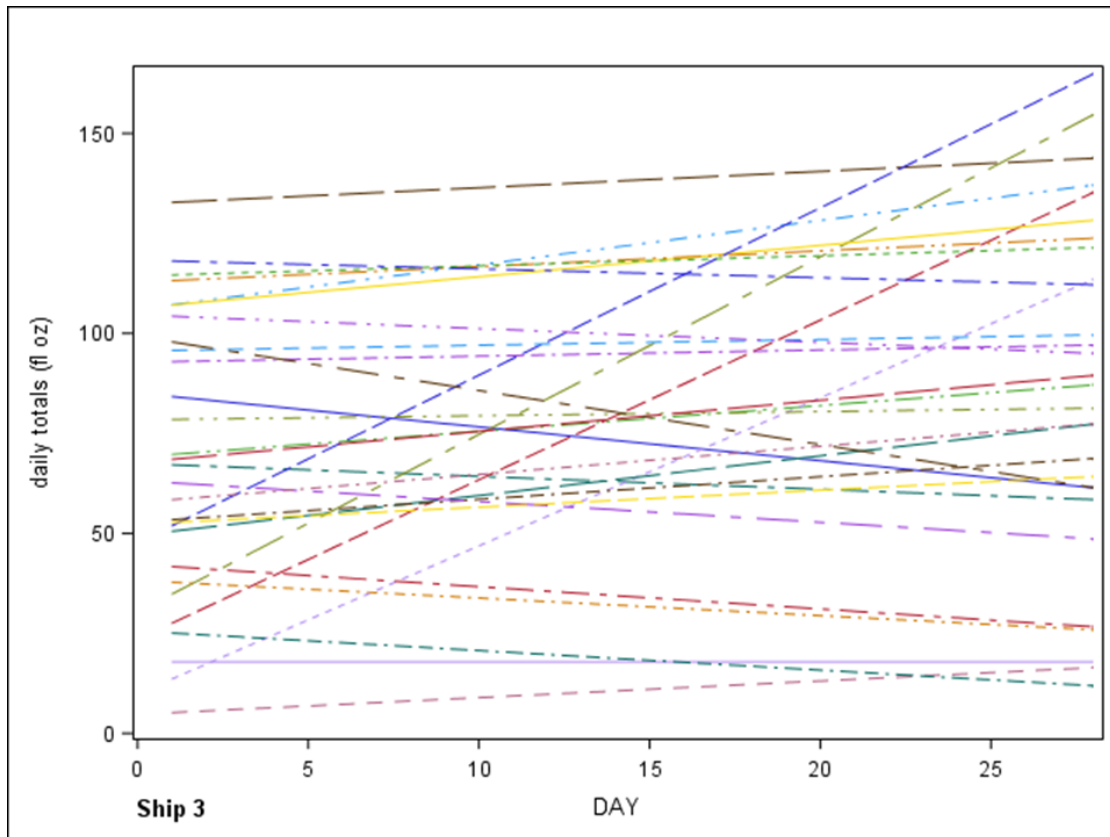
Like other ships, water was the top choice of drink by seafarers but on this ship, fruit juice was slightly more popular than coffee (fig. 11).

Ship 2: Quiz Results

Participants on this ship scored an average of 81% on the quiz. Significant results included one participant who thought you could survive for a month without water and one participant who thought that healthy urine should be dark yellow in colour rather than clear/pale yellow.

Ship 3 Results

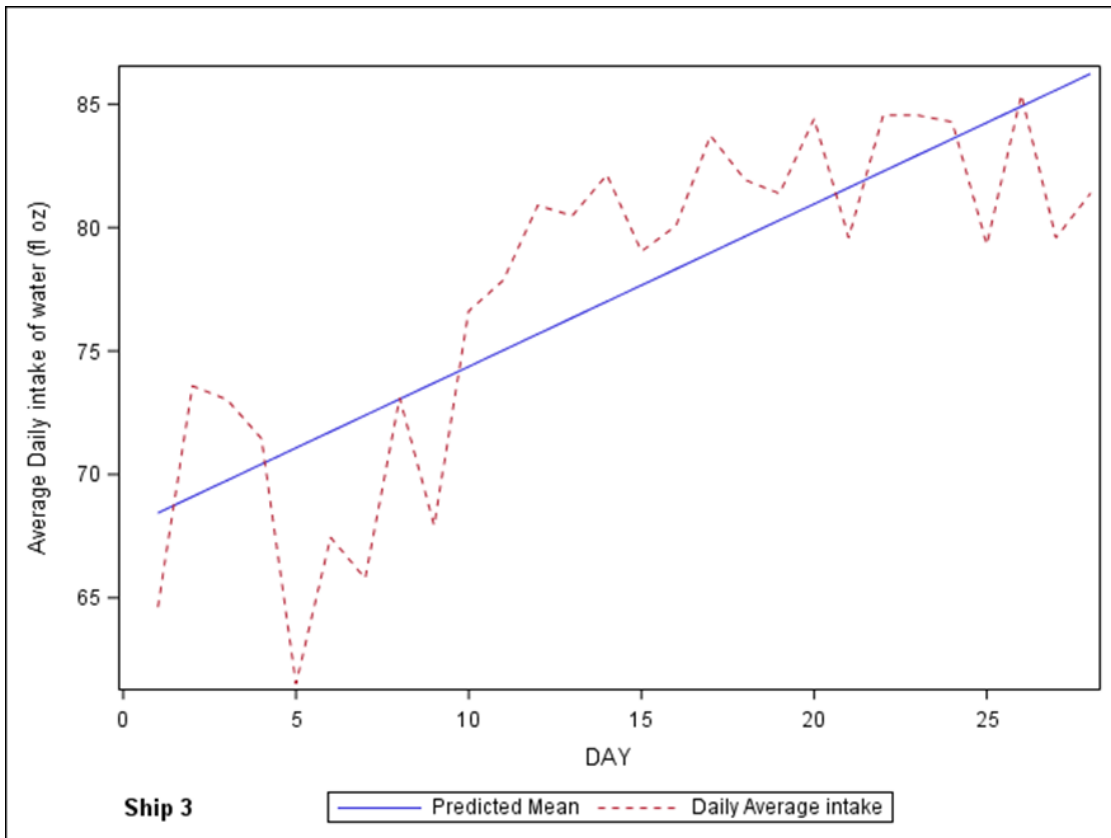
Fig. 12: Average individual water consumption on ship 3



Ship 3 had the largest number of participants – 29 (fig. 12). Throughout the campaign, 19 participants recorded an average increase in water intake and 10 participants recorded an average decrease. However, three of those participants still recorded what could be considered adequate volumes of water intake over the 28 days. The average intake recorded by participants on day 1 of the campaign was similar to the experimental ship at 63 fl oz (1.9 litres). However most participants recorded higher levels as the campaign progressed, with only 17% of participants recording water intake of less than 68 fl oz (2 litres) per day throughout the campaign.

In comparison to the experimental ship and ship 2, there is a stronger upward trend in the volume of water consumption recorded especially from day 6 onwards – as shown in figure 13. It is possible that the large number of participants on this ship could have had a positive impact on individuals' hydration habits.

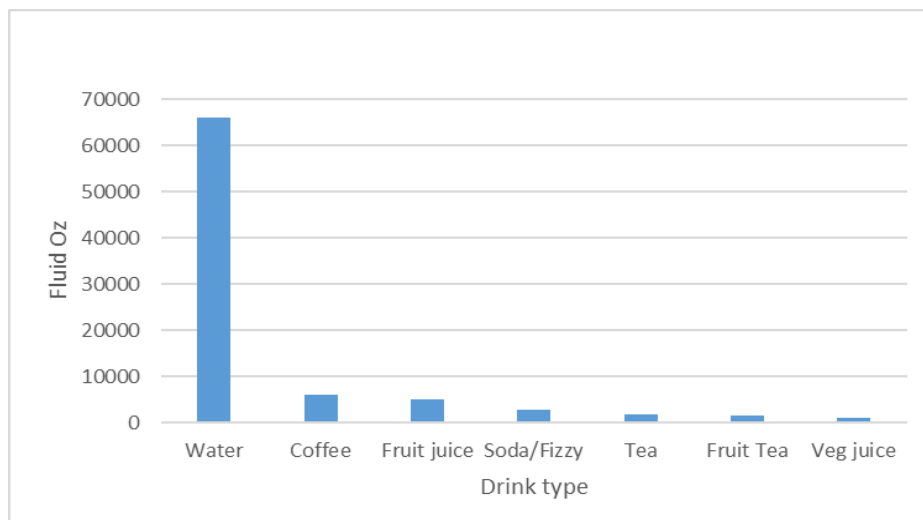
Fig. 13: Model-predicted average water intake vs recorded intake on ship 3



Ship 3: Drink Type

Although ship 3 doesn't differ significantly in the drink choices of participants, soda/fizzy drinks were the 4th most popular drink here (fig. 14).

Fig. 14: Fluid intake by drink type on ship 3

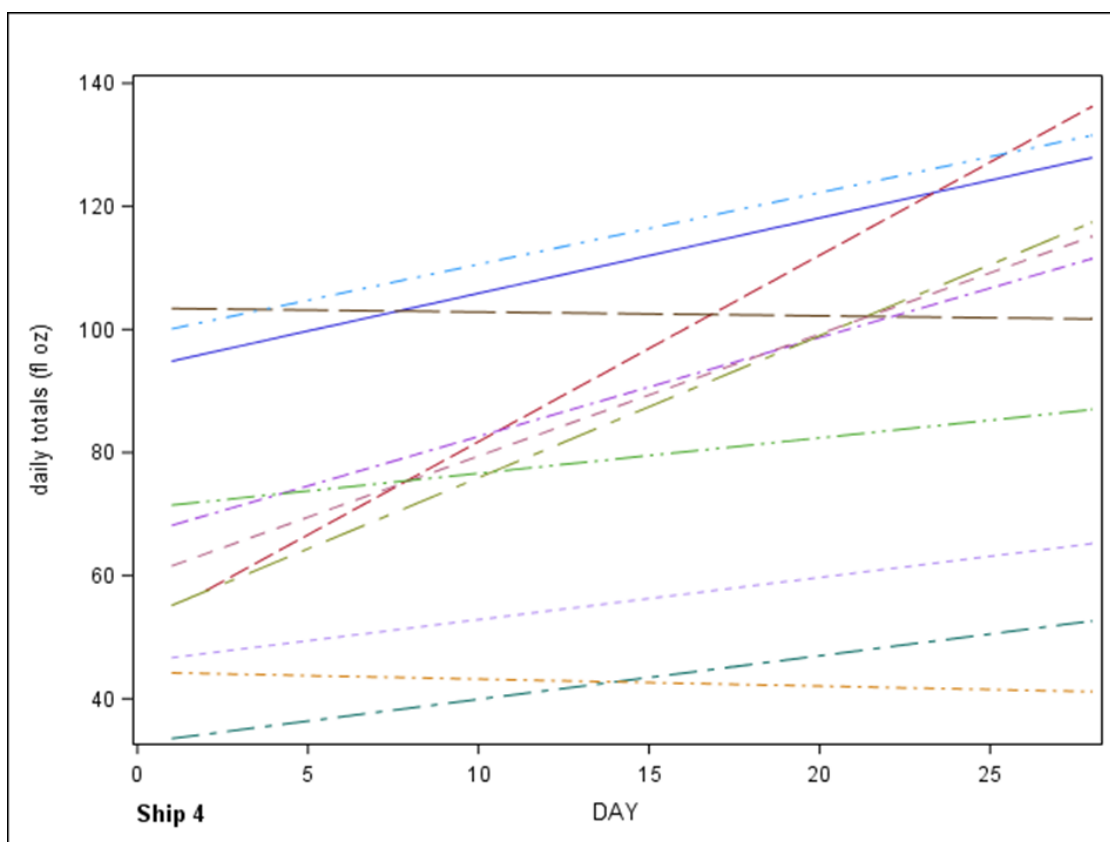


Ship 3: Quiz Results

Ship 3 had the lowest average score out of all ships at 70% with 7/29 participants (25%) who thought that you could survive for a month without water. Just over 10 % of participants (3/29) thought that fizzy drinks help to protect your teeth and gums, selecting that answer instead of water. This is interesting because soda/fizzy drinks were more popular on this ship than any other ship. Finally, 5/29 (17%) did not know that the colour of healthy urine is pale yellow or clear.

Ship 4 Results

Fig. 15: Average individual water consumption on ship 4

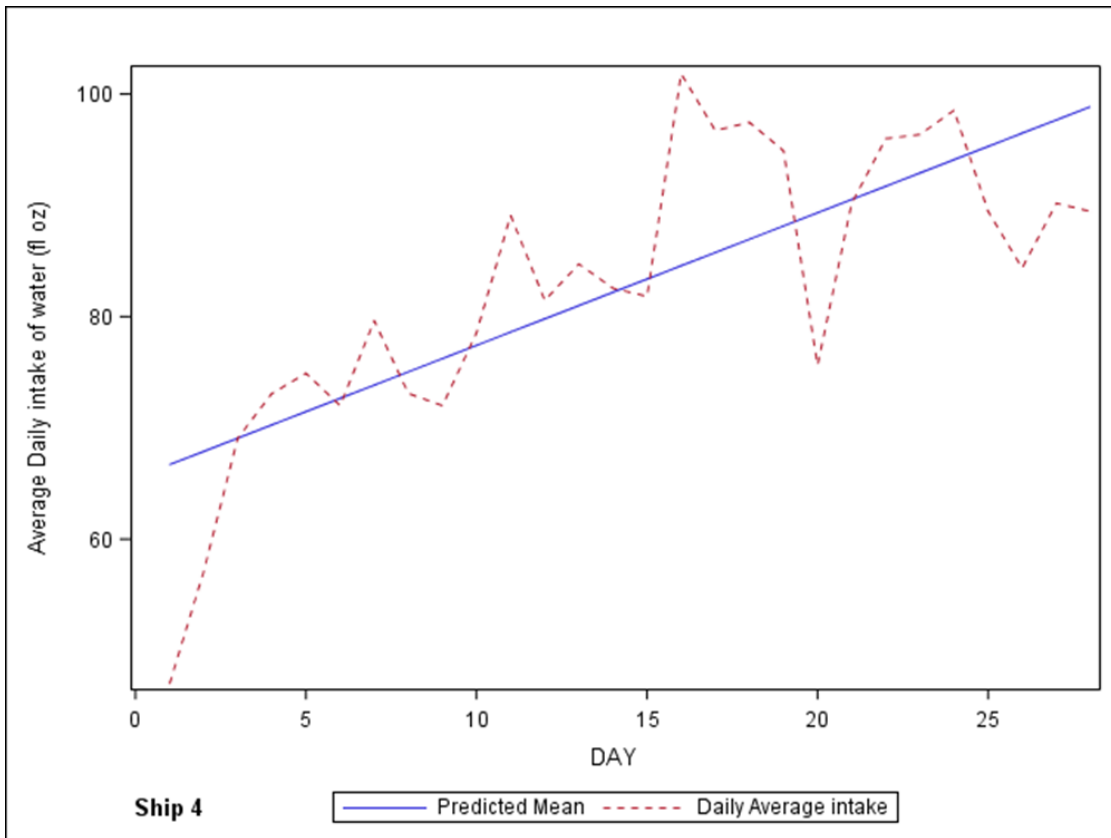


Ship 4 had the fewest participants of all ships – 11 (fig. 15), and the average water intake on day 1 of the campaign was just under 50 fl oz (1.5 litres) – the lowest of all four ships. On this ship, a large majority of participants (9/11) recorded an average increase over the course of the campaign and only two recorded a decrease in water intake; but one of those participants still recorded a water intake of at least 68 fl oz (2 litres) throughout the campaign.

Although this ship recorded the lowest water intake on day 1 of the campaign, the largest increase in water consumption during the 28-day period was seen on this ship with four participants nearly doubling their water consumption over the course of the campaign.

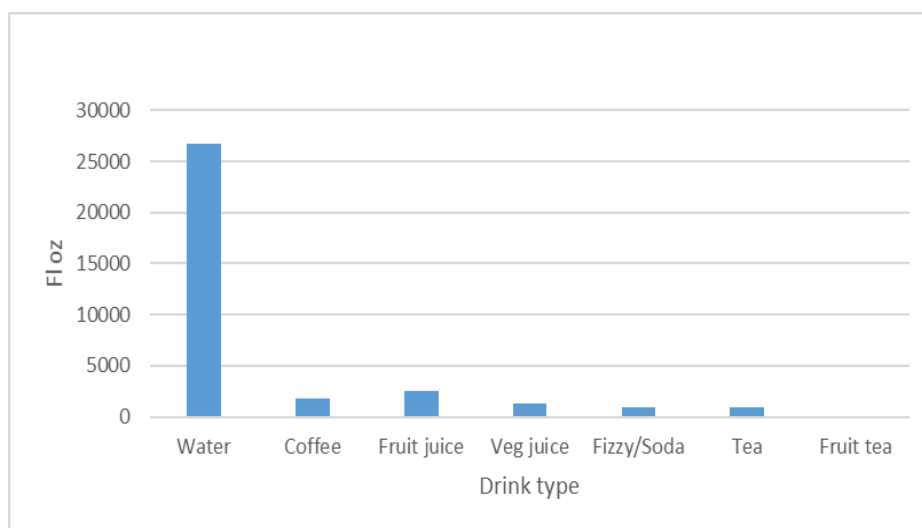
As shown in figure 16, there is a general upward trend in water consumption from day 2 of the campaign compared with day 6 on ships 2 and 3.

Fig. 16: Model-predicted average water intake vs recorded intake on ship 4



Ship 4: Drink Type

Fig. 17: Fluid intake by drink type on ship 4



Drink type was similar to the other three ships and similarly to ship 2, fruit juice was more popular than coffee (fig. 17).

Ship 4: Quiz Results

On ship 4, 86% of participants scored 100% on the campaign quiz which was the highest score of all ships. Significant results included 2/11 participants who thought that consuming 1-2 glasses of water a day was sufficient for good health, and one participant who thought you could live for a month without water. All participants from ship 4 knew that healthy urine should be clear or pale yellow.

Conclusion

The data gathered as part of this Hydration Campaign offers some basic insights into the water consumption of seafarers which could be a useful point of comparison with future studies. Overall the results indicate that:

- the majority of seafarers participating in the campaign drank seemingly healthy volumes of water on board
- some seafarers are not drinking enough water over the course of their working day
- seafarers on board these vessels appear to be consuming very low levels of sugary and heavily caffeinated drinks and are opting for water instead
- all ships showed an increase in average consumption of water over the course of the survey

It is difficult to know which factors had the biggest impact on these results. For instance, working for a company which has made efforts to encourage seafarers to drink healthy amounts of water on board is likely to have played a large part in many of the seafarers' water consumption. This Hydration Campaign is also likely to have had some impact on seafarers who increased their average intake over the course of the 28 days. As we did not see a significant difference in increase on the experimental ship compared to the other ships, it's possible that the act of recording what they drank every day could have also worked as a reminder to drink enough.

Although only a small number of participants recorded water consumptions that were very low (9/73 – 12%), it raises a concern about some seafarers not being adequately hydrated. However, considering some of these seafarers were routinely recording very low water intake, it is possible that some of this data wasn't being noted accurately by some individuals.

An important finding from this campaign is that most of the participants who scored relatively poorly on the quiz were also the participants who recorded the lowest volumes of water consumption. This may indicate a need for further information on hydration and other health needs so that choices made are based on sound knowledge.



There are a number of ways this issue could be highlighted among seafarers. First and foremost is the ease of access to drinking water at all times of the day. In any busy work environment on board or ashore, it can be easy to go for long periods without drinking enough water so it is essential that barriers to accessing water are minimised or eliminated. Another consideration is the food available on board; if meals served contain too much salt and/or sugar, or do not include suitable portions of vegetables, seafarers will be more at risk of dehydration. There are inexpensive materials which shipping companies can use on board to help encourage seafarers to think about the impact of hydration on their overall health. The materials used on the experimental ship in this campaign can be viewed [here](#).

It would be interesting and useful to follow up this study with wider reaching investigations and more in-depth analyses of the issue of hydration on board. These could include:

- Conducting similar studies on vessels where no previous hydration campaigns exist
- Encouraging shipping companies to run their own hydration campaigns and pool results
- Running a wide-reaching survey with focus groups of seafarers to further test hydration habits on board, including investigation into barriers to drinking enough water, and knowledge of the importance of adequate hydration to health
- In-depth on-board research to investigate the environment and assess both barriers and facilitators to adequate water consumption on board

For further information about the Hydration Campaign and ISWAN's health resources, please contact iswan@iswan.org.uk.