Funded by the European Union

e-Newsletter

Issue 5

February 2025

HEALTHY SAILING

HEALTHY SAILING Project Status Update

Updates from the Coordination

Over the last two years of project implementation, HEALTHY SAILING has aimed to provide an integrated, evidence-based methodological approach to improve passenger shipping service quality, facilitate pandemic recovery and make passenger shipping safer, more resilient, competitive, and efficient. These activities have produced evidence to feed project guidelines, outputs, and training. The consortium is focusing on completing intervention studies and moving from the verification phase to the integration phase.

Public Health Congress on Maritime Transport and Ports 2024

HEALTHY SAILING partners made a significant impact at the Public Health Congress on Maritime Transport and Ports 2024, held on 18-19 October 2024 in Naples, Italy, by presenting **9 abstracts** and delivering **12 presentations during various roundtable sessions.** (Read more in page 3).

International Scientific Panel for infectious diseases related to passenger ships

The first meeting of the **International Scientific Panel (ISP) for infectious diseases related to passenger ships** was conducted on 1 October 2024. The ISP was established based on a need to harmonize global responses to public health events – both routine and emergency – on passenger ships. Under the HEALTHY SAILING framework, the ISP provides **strategic perspectives and global experience to complement scientific expertise of the project consortium.** Its objectives are to create a forum at global level to exchange lessons learned and best practices related PMM of infectious diseases on passenger ships. The meeting included participation of representatives from **ECDC**, the **US CDC**, **Taiwan CDC**, **ANVISA** and **HEALTHY GATEWAYS**. Moreover, industry representatives from **MedCruise**, **CLIA** and a **non-CLIA cruise line** participated, while a representative from **WHO HQ** attended as an observer. During this meeting, it was proposed that two position papers will be produced by the ISP during the HEALTHY SAILING project. These position papers will focus on management of infectious disease cases/outbreaks on cruise ships, as well as the involvement of relevant stakeholders. One position paper plans to address respiratory illnesses on cruise ships, while the other position paper is intended to address mpox on cruise ships. Drafting of the position papers will begin shortly.

NEWSLETTER SUBSCRIPTION

Subscribe to the HEALTHY SAILING eNewsletter: https://healthysailing.eu/category/newsletters/

If you are already subscribed to our newsletter and you would like to unsubscribe, you may do so by clicking here or by sending us an email to the following address: it[at]healthysailing.eu

This is a biannual publication of the HEALTHY SAILING project. Next issue: August 2025

Inside this issue:

HORIZON EUROPE

Project Nr. 101069764

Website:

https://healthysailing.eu/

Follow us:

Updates from the Coordination

HEALTHY SAILING Upcoming Events

SAVE THE DATE

Steering Committee meeting

The 10th HEALTHY SAILING Steering Committee **online** meeting has been scheduled for **13rd of March 2025**.

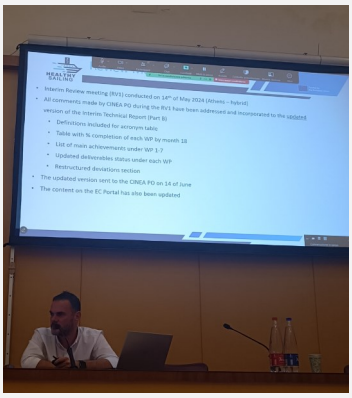
Status of project deliverables and tasks

As of February 2025, a total of **21 out of 35 project deliverables** have been submitted, while 5 out of 7 milestones have been achieved. The completion percentage of work packages is nearly **68% for the 7 project work packages**. From September 2022 to November 2024, nearly **282 technical and scientific meetings (internal and external)** were conducted.

No.	Deliverable Name
D1.1	Project quality assurance & management plan
D2.1	Data management plan
D2.2	Interim dissemination & exploitation plan
D2.4	Data management plan (revised version)
D2.5	Final dissemination and exploitation plan (revised version)
D3.1	Foundation report for COVID-19 related preliminary results
D3.2	Report from intervention studies & pilot-runs (first version)
D3.3	Report on computational modelling of droplet and aerosol dispersion (validation data report)
D3.4	Evidence-based guidelines (COVID-19 interim guidelines)
D3.5	Foundation report (revised version)
D3.6	Report from intervention studies & pilot-runs (for COVID-19 related preliminary results)
D3.8	Report on computational modelling of droplet and aerosol dispersion (model validation report)
D4.1	Procedures for syndromic surveillance
D4.2	Integrated e-surveillance system for health threats (first version)
D5.2	Artificial Intelligence Water Safety Plan (first version)
D5.3	Inventory of diagnostic laboratory methods
D6.2	Terms of reference - International expert panel
D7.1	Tool-kit for technology-induced behavioural change in hand hygiene
D7.2	Blended Learning training toolkit enriched with hands-on training (HOT) - first version for COVID-19 module
D7.4	Study Initiation Package
D7.5	Midterm recruitment report

3rd HS General Assembly (GA) meeting

The 3rd HS General Assembly (GA) meeting was conducted on the 19th October 2024 in hybrid format in Naples-Italy, during the 2nd day of the international "Public Health Congress on Maritime Transport and Ports 2024: Innovations in infectious diseases control and occupational health".



Horizon Results Booster

The HEALTHY SAILING project has recently used the European Commission's **Horizon Results Booster** services to enhance the exploitation of its key research outcomes. This initiative offers free support to EU-funded projects, aiding them in navigating the complexities of dissemination and exploitation.

Focusing on the **Artificial Intelligence Water Safety Plan** which is a tool that will provide decision support to simplify the process for WSP development, improve water quality and prevent waterborne diseases, the project coordinator and task leaders engaged with the Horizon Results Booster's expert team. They utilized the "Portfolio Dissemination & Exploitation Strategy" service, specifically Module C, which assists projects in refining their exploitation strategies. Through this collaboration, the team completed tailored templates and participated in consultative meetings, receiving valuable recommendations to optimize the IIS's deployment and impact. **Encouraged by the positive outcomes, HEALTHY SAILING plans to apply this methodology to other key exploitable results, ensuring a comprehensive and effective exploitation approach across the project's innovations.**

BOOSTER

Project Status Update

Publications, Dissemination & Communication activities

Article in journal

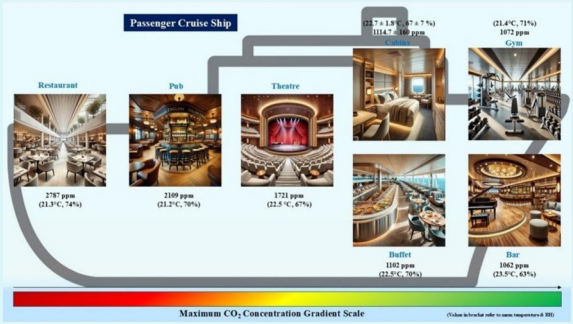
Monitoring of indoor air quality at a large sailing cruise ship to assess ventilation performance and disease transmission risk.

Ho Yin Wickson Cheung, Prashant Kumar, Sarkawt Hama, Ana Paula Mendes Emygdio, Yingyue Wei, Lemonia Anagnostopoulos, John Ewer, Valerio Ferracci, Edwin R. Galea, Angus Grandison, Christos Hadjichristodoulou, Fuchen Jia, Pierfrancesco Lepore, Lidia Morawska, Varvara A. Mouchtouri, Niko Siilin, Zhaozhi Wang, the HEALTHY SAILING project. Science of The Total Environment, Volume 962, 2025, 178286, ISSN 0048 697

Abstract

Large passenger ships are characterised as enclosed and crowded indoor spaces with frequent interactions between travellers, providing conditions that facilitate disease transmission. This study aims to provide an indoor ship CO2 dataset for inferring thermal comfort, ventilation and infectious disease transmission risk evaluation. Indoor air quality (IAQ) monitoring was conducted in nine environments (three cabins, buffet, gym, bar, restaurant, pub and theatre), on board a cruise ship voyaging across the UK and EU, with the study conducted in the framework of the EU HEALTHY SAILING project. CO2 concentrations, temperature and relative humidity (RH) were simultaneously monitored to investigate thermal characteristics and effectiveness of ventilation performance. Results show a slightly higher RH of 68.2 ± 5.3 % aboard compared to ASHRAE and ISO recommended targets, with temperature recorded at 22.3 ± 1.4 °C. Generally, good IAQ (<1000 ppm) was measured with CO2 mainly varying between 400 and 1200 ppm. The estimated air change rates (ACH) and ventilation rates (VR) implied sufficient ventilation was provided in most locations, and the theatre (VR: 86 L s−1 person−1) and cabins (VR: >20 L s−1 person−1) were highly over-ventilated. Dining areas including the pub and restaurant recorded high CO2 concentrations (>2000 ppm) potentially due to higher footfall (0.6 person m−2 and 0.4 person m−2) and limited ACH (2.3 h−1 and 0.8 h−1), indicating a potential risk of infection; these areas should be prioritised for improvement. The IAQ and probability of infection indicate there is an opportunity for energy saving by lowering hotel load for the theatre and cabins and achieving the minimum acceptable VR (10 L s−1 person−1) for occupants' comfort and disease control. Our study produced a first-time dataset from a sailing cruise ship's ventilated areas and provided evidence that can inform guidelines about the optimisation of ventilation operations in large passenger ships, contributing to respiratory health, infection control and energy efficiency aboard.

Read full article here



Article in journal

Scoping review of infectious disease prevention, mitigation and management in passenger ships and at ports: mapping the literature to develop comprehensive and effective public health measures

Lemonia Anagnostopoulos, Sotirios Vasileiadis, Leonidas Kourentis, Zacharoula Bogogiannidou, Ioanna Voulgaridi, Gordon Nichols, Fani Kalala, Matthaios Speletas, Christos Hadjichristodoulou, Varvara A. Mouchtouri & the EU HEALTHY SAILING project. Tropical Medicine and Health volume 53, Article number: 3 (2025)

Abstract

Background: With various infectious disease risks to passenger ship travellers, guidance for infectious disease prevention, mitigation and management (PMM) exists. Emerging infections and emergencies necessitate updated, context-specific guidelines and practices. New evidence for infection PMM must be translated into guidance for governmental authorities and the passenger ship industry. Under the European HEALTHY SAILING project, we conducted a scoping review of publications in PubMed, Scopus and grey literature for scientific articles, regulations, guidelines and policies describing infectious disease PMM in seaports, cruise, ferry, expedition and river cruise ships between 1990 and 2023.

Main findings: Of 620 publications most were peer-reviewed articles (57.7%) and technical guidance (27.9%), followed by reports/other documents (9.1%), industry guidance (3.4%) and legislation (1.9%). Half (50.5%) of all publications addressed respiratory illnesses, fewer addressed gastroenteritis (11.5%), Legionnaire's (6.1%), other vaccine-preventable (3.2%), vector-borne (1.6%) and sexually transmitted (1.0%) diseases. Most publications focus on infectious disease in seagoing cruise ships (75.7%) compared to ferries, expedition and river cruise ships (26.6%, 16.9%, 16.3%, respectively). Fewer publications addressed seaports (39.0%), shoreside personnel (19.7%) and port communities (2.4%). Most literature was published between 2020 and 2023 (50.2%) with a peak addressing respiratory illnesses (264 publications) during this period. A trend in volume and type was observed based on public health emergencies associated with the publication year.

Conclusions: Peer-reviewed articles and guidance primarily address respiratory and gastrointestinal illnesses, seagoing cruise ships and onboard populations. Gaps on the following topics exist: other infectious disease types; other passenger ship types; land-based personnel and port communities. Future research could assess risk factors and PMM measure effectiveness considering vaccine-preventable, vector-borne and sexually transmitted diseases. The evidence-base should be strengthened to produce guidelines targeting specificities of seaports, ferries, expedition and river cruise ships. Developing guidelines to standardise passenger ship outbreak investigation reporting could help evaluate PMM measure effectiveness, the impact of passenger ship travel on port communities and vice versa. Modern passenger ship experiences—from educational to elderly focused cruising—present diverse public health risks, requiring continuous efforts by public health authorities and the shipping industry. While outside the review's scope, measures may impact travellers' mental health, necessitating strategies when designing and implementing PMM measures. **Read full article here**

Publications, Dissemination & Communication activities

Article in journal

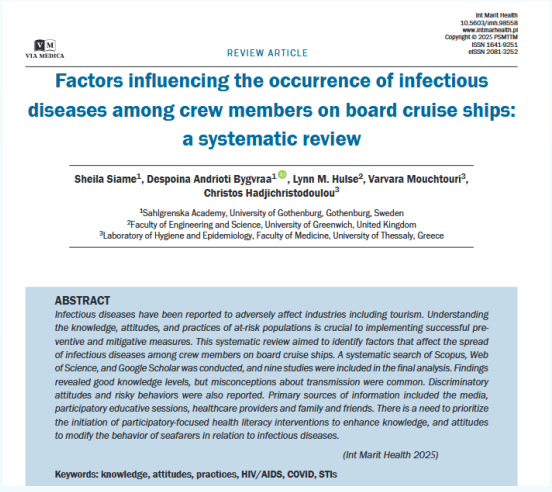
Factors influencing the occurrence of infectious diseases among crew members on board cruise ships: a systematic review

Sheila Siame, Despoina Andrioti Bygvraa, Lynn M. Hulse Hulse, Varvara Mouchtouri, Christos Hadjichristodoulou
Int Marit Health 10.5603/imh.98558

Abstract

Infectious diseases have been reported to adversely affect industries including tourism. Understanding the knowledge, attitudes, and practices of at-risk populations is crucial to implementing successful preventive and mitigative measures. This systematic review aimed to identify factors that affect the spread of infectious diseases among crew members on board cruise ships. A systematic search of Scopus, Webof Science, and Google Scholar was conducted, and nine studies were included in the final analysis. Findings revealed good knowledge levels, but misconceptions about transmission were common. Discriminatory attitudes and risky behaviors were also reported. Primary sources of information included the media, participatory educative sessions, healthcare providers and family and friends. There is a need to prioritize the initiation of participatory-focused health literacy interventions to enhance knowledge, and attitudesto modify the behavior of seafarers in relation to infectious diseases.

Read full article here


Int Marit Health
10.5603/imh.98558
www.intmarhealth.pl
Copyright © 2025 PZWFTM
ISSN 1641-9251
eISSN 2081-3252

VIA MEDICA

REVIEW ARTICLE

Factors influencing the occurrence of infectious diseases among crew members on board cruise ships: a systematic review

Sheila Siame[1], Despoina Andrioti Bygvraa[1], Lynn M. Hulse[2], Varvara Mouchtouri[3], Christos Hadjichristodoulou[3]

[1]Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden
[2]Faculty of Engineering and Science, University of Greenwich, United Kingdom
[3]Laboratory of Hygiene and Epidemiology, Faculty of Medicine, University of Thessaly, Greece

ABSTRACT

Infectious diseases have been reported to adversely affect industries including tourism. Understanding the knowledge, attitudes, and practices of at-risk populations is crucial to implementing successful preventive and mitigative measures. This systematic review aimed to identify factors that affect the spread of infectious diseases among crew members on board cruise ships. A systematic search of Scopus, Web of Science, and Google Scholar was conducted, and nine studies were included in the final analysis. Findings revealed good knowledge levels, but misconceptions about transmission were common. Discriminatory attitudes and risky behaviors were also reported. Primary sources of information included the media, participatory educative sessions, healthcare providers and family and friends. There is a need to prioritize the initiation of participatory-focused health literacy interventions to enhance knowledge, and attitudes to modify the behavior of seafarers in relation to infectious diseases.

(Int Marit Health 2025)

Keywords: knowledge, attitudes, practices, HIV/AIDS, COVID, STIs

Public Health Congress on Maritime Transport and Ports 2024

18-19 October 2024, Naples, Italy

HEALTHY SAILING partners made a significant impact at the Public Health Congress on Maritime Transport and Ports 2024, held on 18-19 October 2024 in Naples, Italy, by presenting **9 abstracts** and delivering **12 presentations during various roundtable sessions.**

A total of **230 in-person and online participants** from the shipping industry, academia, governmental officials, port administrations, marine companies, and related stakeholders participated in the congress.

The 47 abstracts (28 Oral Abstracts, 19 e-posters) **will be published in the journal Population Medicine** (https://www.populationmedicine.eu/).

This active participation showcased the project's extensive activities and results to an international scientific audience, contributing valuable insights into innovations in infectious disease control and occupational health within the maritime transport sector.

Project Status Update

Publications, Dissemination & Communication activities

European Public Health Conference 2024

12-15 November, 2024, Lisbon

The HEALTHY SAILING project was proudly represented at the **European Public Health Conference** in Lisbon (November 12-15, 2024), where our latest research was showcased. As part of Task 3.2.2, UKE presented a poster entitled: "Infectious Diseases on Passenger Ships: Port Preparedness and Response – A Narrative Systematic Review." This review examines how ports manage and respond to infectious disease risks associated with passenger ships.

By analyzing preparedness strategies and response mechanisms, the study provides valuable insights for improving infectious diseases prevention, mitigation and management in passenger shipping within the port environment.

The conference provided an excellent opportunity to discuss our project and findings with public health experts, and other stakeholders, fostering collaboration for safer and healthier maritime travel.

17th International Symposium on Maritime Health

HS will be presented at the at 17th International Symposium on Maritime Health, 11-14 June 2025, Rotterdam, The Netherlands.

Read more here

ISMH 17

THE INTERNATIONAL SYMPOSIUM ON MARITIME HEALTH

SEA the Future 2025

26-28 February 2025, Pattaya, Thailand

https://www.sea-future.com/

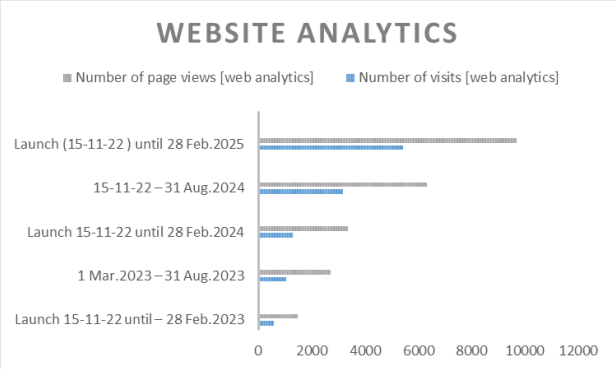
The theme of the 3rd SEA the Future Conference was **"Sustainable Oceans and Coasts for next generations".** Assoc. Prof. Despoina Andrioti Bygvraa from the University of Gothenburg represented HEALTHY SAILING by delivering a poster presentation titled **"Healthy Sailing: Prevention, Mitigation and Management of Infectious Disease on Cruise Ships and Passenger Ferries".**

Project Status Update

Website and Social Media Analytics

Website analytics

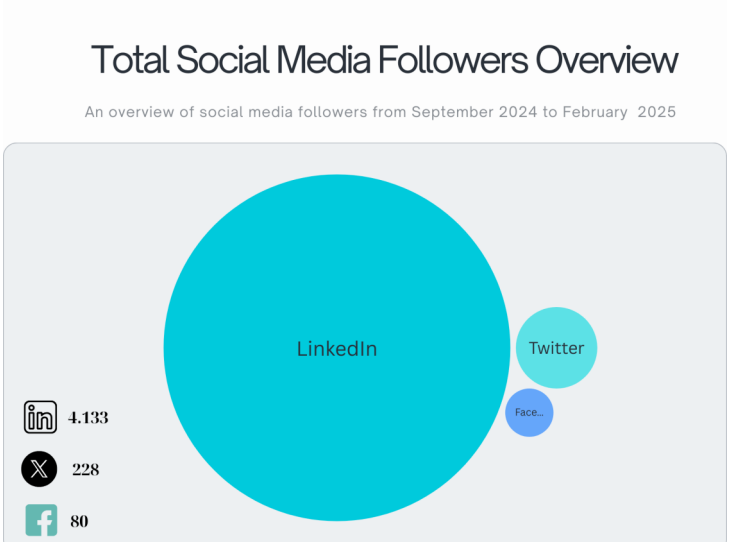
Since the launch of the HEALTHY SAILING website in November 2022, a total of **9694 page views** & **5439 visits** have been recorded.

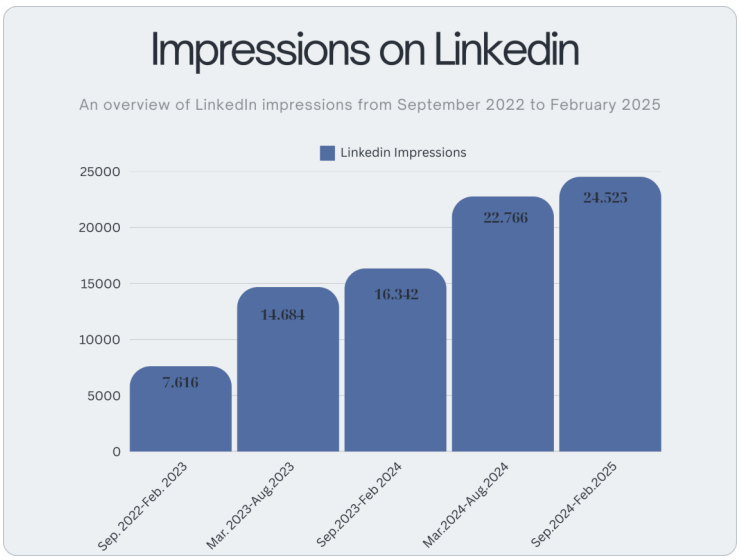


Document	Number of Downloads
Newsletter Issue 1	1388
Newsletter Issue 2	717
Newsletter Issue 3	482
Newsletter Issue 4	155
Brochure	1739

Social media analytics

The numbers of followers, impressions and engagements have increased on HEALTHY SAILING social media accounts, particularly for LinkedIn.





Social media platform	Indicator	Total
LinkedIn	Number of impressions	85.931
	Number of followers/fans/ subscribers	12.043
	Number of posts	74
	Number of engagements: shares, likes, click throughs,	1.830
	Number of hashtag mentions	45
X	Number of impressions	3.595
	Number of followers/fans/ subscribers	949
	Number of posts	61
	Number of engagements: shares, likes, click throughs,	379
	Number of hashtag mentions	43
Facebook	Number of impressions	736
	Number of followers/fans/ subscribers	266
	Number of posts	42
	Number of engagements: shares, likes, click throughs, comments	228
YouTube	Number of videos:	13
	Number of viewers:	438
Research Gate	Number of connections	192

Project Status Update

Vaccination Guidelines for Passengers and Crew

As part of Work Package 3, **vaccination guidelines for passengers and crew on cruise ships and large passenger ferries are being developed** in collaboration with EUVABECO. These guidelines aim to strengthen onboard disease prevention by establishing clear protocols for vaccination coverage, booster requirements, and outbreak response strategies.

A draft protocol has been prepared and will be tested through focus groups onboard to assess feasibility and effectiveness. Additionally, specific medical operation guidelines for expedition vessels are being designed to address the unique healthcare challenges of remote maritime environments.

This initiative will support the implementation of standardized vaccination policies, ensuring safer voyages and improved public health protection across the passenger shipping industry.

euvabeco

Demonstrating the Future of Seamless and Secure Travel: Integrated e-Pass (Task 6.2)

As part of **Work Package 6**, a major milestone in digital transformation for passenger safety and efficiency will be demonstrated onboard the **Celestyal Discovery** from **April 11–14, 2025**. Led by **FREDU-Cyprus, ICCS-EL, and UTH-EL**, the trial will showcase the **integrated e-pass based on the One-ID concept**, designed to optimize embarkation, enhance crowd control, and facilitate rapid contact tracing in case of outbreaks.

The **wearable RFID e-pass (bracelet or key card format)** will enable real-time tracking, ensuring fast and seamless access to vaccination and health certificates via the **E-Surveillance System (E-SS)** while maintaining strict data privacy. The system will also support early detection of close contacts of infected travelers through strategically placed **RFID readers** at key ship locations.

This innovative approach aims to **enhance health security, streamline passenger movement, and minimize outbreak risks**, setting a new standard for safe and efficient cruising.

Project Status Update

Modelling of Prevention, Mitigations and Management (PMM) measures to control infection risk and disease transmission (Task 3.4)

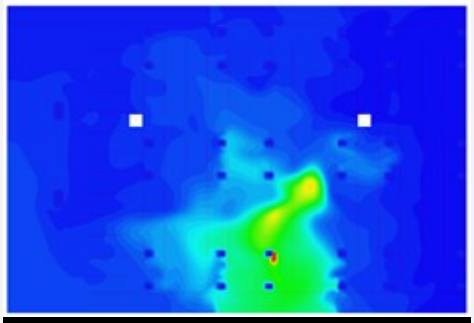
Following the earlier successfully completed tasks of experimental data capture to evaluate aerosol and tracer gas dispersion on a cruise ship at sea (WP3 partners UoS, UoG and VTT), and the validation of CFD modelling approaches for simulating these effects (UoG and VTT), TASK 3.4 partners UoG and VTT are currently working **on Eulerian (tracer gas) and Lagrangian (particle tracking) modelling of Prevention, Mitigations and Management (PMM) measures to control infection risk and disease transmission** in selected shipboard spaces.

Bar area on a cruise ship

This work contributes to Deliverable D3.9, which will report on the efficacy of various PMM measures, such as ventilation changes, mask usage, portable air purifier units (PAPU), table partitions and social distancing. **Preliminary results (subject to change) suggest PAPUs can reduce infection risks in small compartments, while existing ventilation in some special purpose spaces is sufficient to minimize infection risks assuming a small number of occupants.** Conversely, mitigations such as **adding physical partitions separating tables in dining spaces produce mixed results.** In some situations, **displacement ventilation can produce significant reductions in infection risk and even the typical shipboard ceiling to ceiling ventilation can be beneficial by forcing larger respired droplets to gravitationally settle**.

SMARTFIRE CFD geometry model of Bar area

Work on Task 3.4 continues exploring the effectiveness of additional mitigation strategies. This work has been supported by HS partners completing Task 3.4 questionnaires designed to characterize the range of ventilation systems found on diverse cruise ships, to better understand general respiratory pathogens, and to suggest possible/acceptable mitigation approaches to manage onboard pandemic outbreaks. **If you have been requested to complete one of these questionnaires, or if you would like to contribute information, especially related to ship ventilation system design and operation, please feel free to get in touch**.



SMARTFIRE generated quanta concentration within a dining room generated by a single seated index patient

Project Status Update

HEALTHY SAILING Team Develops Training Video for Enhanced Surface Cleaning and Disinfection

Building upon the groundwork described in our August 2024 newsletter, the HS team has moved forward with Task 5.2, "Toolkit for Systematic Monitoring of Surface Cleaning and Disinfection". We are currently developing a training video and augmented reality (AR) training materials, offering a detailed walkthrough of the Standard Operating Procedures (SOPs) for cleaning and disinfecting staterooms and public toilets. This is a collaborative effort by the Laboratory of Hygiene and Epidemiology at the University of Thessaly (UTH, Greece), the EU SHIPSAN Association, the Leibniz Institute for Plasma Science and Technology (INP, Germany), National and Kapodistrian University of Athens (NKUA, Greece), and MSC Cruises.

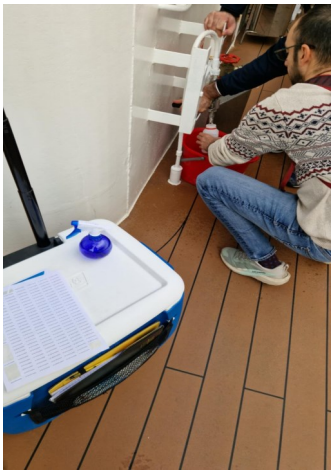
Both the video and AR materials serve as key components of the toolkit's training materials, aiming to improve the effectiveness of cleaning and disinfection practices on cruise ships and prevent infectious diseases transmitted through fomites by providing clear and actionable guidelines for housekeeping personnel.

We sincerely thank the Captain, Officers, and Crew of the MSC Sinfonia for their exceptional support. Special appreciation goes to the housekeeping team, whose cooperation was invaluable during our week-long stay aboard to film the necessary scenes for the video material.

Next, we plan to organise a three-week ship visit to implement the intervention study.

For more insights into our ongoing efforts to elevate hygiene practices aboard passenger ships, refer to our August 2024 newsletter, which details the development of SOPs and the initiation of intervention studies assessing the effectiveness of the toolkit.

AI-Water Safety Plan Tool (Task 5.4)



The HS consortium has made significant progress in Task 5.4, "AI-Water Safety Plan Tool. During a recent seven-day visit on board the **MSC Sinfonia,** as part of an intervention study, the team conducted a comprehensive audit of the existing water safety plan of the ship and evaluated the first version of the AI-powered decision support tool (AI-WSP tool). This innovative tool is a collaborative development by the Leibniz Institute for Plasma Science and Technology (INP, Germany), National and Kapodistrian University of Athens (NKUA), the EU SHIPSAN Scientific Association and the Laboratory of Hygiene and Epidemiology of the University of Thessaly (UTH). As part of the intervention study, the team also administered Baseline Knowledge Attitude Practices surveys and collected water samples. The AI-WSP tool is designed to streamline the creation of water safety plans and manage the operational monitoring of water-related parameters on passenger ships, utilizing artificial intelligence for enhanced decision-making.

The integration of AI-driven decision support is poised to enhance the efficiency of Water Safety Plan (WSP) implementation by:

⇒ **Reducing Development Time**: The tool offers an electronic environment that guides users through the process, providing decision support to expedite plan creation.

⇒ **Minimizing Administrative Effort:** By digitizing the procedure, the tool lessens paperwork, allowing the entire process to be completed within the platform.

⇒ **Optimizing Human Resources:** With built-in decision support and predefined risk assessment values, the need for external experts is diminished, and potential hazards are identified with recommended control measures that might otherwise be overlooked.

Furthermore, the AI-WSP tool will interface directly with the AI-IIS (Artificial Intelligence Intelligent Immune System), another HEALTHY SAILING prototype. This integration enables the AI-IIS to receive real-time data, analyze information from multiple inputs, and generate alerts for public health threats. It also provides recommendations for health measures, monitors their implementation, and ensures effective resolution of public health events.

In summary, the AI-WSP tool revolutionizes water safety management on passenger ships by simplifying WSP development and enhancing operational monitoring through artificial intelligence, thereby promoting a safer and more efficient maritime environment.

Related projects and actions

The HS4U enters its final phase: Testing innovative technologies for safer and smarter maritime travel.

The HS4U project is reaching a critical milestone in its mission to enhance maritime health and safety through cutting-edge technologies. As we move towards the final phase, significant progress has been made in risk assessment methodologies, passenger behaviour modelling, virus transmission simulations and sensors and actuators development – all aimed at improving the safety of passengers and crew aboard ships.

One of our major achievements has been the successful completion of environmental recordings. From November 11 to 15, 2024, the HS4U team conducted a crucial mission aboard the MV CELESTYAL DISCOVERY, focusing on environmental data collection and technical collaboration. Led by the LEDRA group under Work Package 5, this initiative aimed to assess onboard conditions, gather behavioural and environmental insights, and lay the groundwork for upcoming pilot activities.

Throughout the week, the team engaged in in-depth discussions and preparations for the demo space—an essential component for testing and validating HS4U technologies in real-world conditions. By conducting real-time scenario evaluations and strategic planning, the HS4U partners tackled potential challenges, refined safeguards, and optimised solutions. Key efforts included determining optimal placements for HS4U technologies in cabins, distributing questionnaires to gain a deeper understanding of the environmental and spatial conditions as well as the user experience onboard, and installing advanced coatings and sensors in communal areas to collect real-time data.

Collaboration with the ship's crew provided valuable insights into HVAC/HVT and water management systems, safety protocols, and critical ship operations. Team members also visited key areas, including the engine room and bridge, to assess fire and gas systems. On November 14, LEDRA hosted a workshop to refine specifications for the Robot Cabin and demo space with the aim of aligning spatial requirements with the next steps for pilot deployment.

The environmental recordings and technical exchanges aboard the MV CELESTYAL DISCOVERY marked a significant milestone for the HS4U project. The knowledge gained from hands-on data collection, collaborative problem-solving, and interactions with the ship's crew and international partners will be instrumental in shaping impactful pilot activities in the months ahead. Beyond advancing technical progress, this initiative also strengthened partnerships and fostered valuable knowledge exchange among all stakeholders.

With the HS4U architecture now finalised, partners are shifting their focus to planning the pilot activities. As part of these efforts, the Risk Assessment module, designed for integration into the CDF platform – a smart system designed to improve real-time communication between crew and passengers and sensors and actuators on the ship, is finalised and is expected to strengthen risk evaluation processes. The research framework for agent-based movement simulations is nearing completion, representing a crucial step in enhancing emergency response strategies.

Significant progress has been made in developing the User Interface Dashboard – a key component of the CDF- , allowing real time monitoring of events and system functionality. Meanwhile, the project has also acquired a robot cabin, which is currently undergoing retrofitting for demonstration purposes, further advancing testing and validation efforts.

On the publications front, 5 new papers have been added to our website **here**, showcasing the project's academic contributions.

Looking ahead, the next major phase will focus on testing the developed technologies through pilot activities, set to take place after April. Stay tuned for updates on our progress, and follow us on our social media channels to stay engaged with the latest developments.

Our website: https://hs4u.eu/

Our social media: LinkedIn, X, Facebook, YouTube

Our bi-annual newsletter