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Health and behavior factors, quality of life and productivity among commercial fishermen in Rhode Island, US: a research framework

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ABSTRACT

Background: *Commercial fishermen represent a particularly vulnerable group within the Blue Economy (BE), enduring hazardous working conditions, strenuous labor, prolonged exposure to extreme weather, and irregular sleep and nutritional patterns. The health of these invisible workers holds significant implications for the social, economic, and environmental dimensions of fisheries, as it directly influences productivity. Despite their importance, no public data are available on fishermen's cardiometabolic health and health behaviors in Rhode Island. However, sound evidence suggests elevated cardiometabolic risks, altered sleep patterns, and chronic stress in similar fishermen populations globally. This paper establishes a comprehensive research framework to examine commercial fishermen's cardiometabolic health, protective and risk factors, quality of life (QoL), lifestyle behaviors, and productivity. The overarching goal is to identify potential targets for intervention to improve commercial fishermen's health behaviors, QoL, and cardiovascular health.*

Materials and methods: *Following the STROBE guidelines, this framework includes methodological, societal, environmental, and economic aspects to guide the development of an exploratory study protocol. A two-phase mixed-methods study will be conducted. Phase 1 (qualitative) will hold two focus groups (n = 6–10 participants per group) and will inform Phase 2 (quantitative), where biomarkers, health factors and behaviors, QoL, and productivity of commercial fishermen (n = 59) will be gathered.*

Results: *Recruitment began in January 2024, and data collection will end in August 2024. The results of this study are expected to be published in 2025.*

Conclusions: *A framework was developed considering the impact and implications of commercial fishermen's health-related behaviors on BE-based states, sustainable communities, and marine ecosystems. This protocol established a guideline-based, two-phase mixed-methods study to explore the cardiometabolic health, QoL, and productivity of commercial fishermen. Since better cardiovascular health is associated with lower risks of cardiovascular disease death and all-cause mortality, the findings will provide a situational screening and inform the development of tailored theory-based preventive behavioral interventions.*

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Keywords: commercial fishermen, Healthy Blue Economy, cardiovascular health, Quality of Life (QoL), Public Health

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INTRODUCTION

BACKGROUND

Commercial fishermen are the most vulnerable Blue Economy (BE) workers. The BE encompasses the sectors directly or indirectly related to the coasts and ocean, including fisheries [1]. Fisheries refer to the enterprise of raising or harvesting fish and other aquatic life and the site where such an enterprise is set up. Commercial fisheries include wild and farmed species, of which around 90% are in oceans and 10% in freshwater bodies. Commercial fishermen are constantly exposed to hazardous working conditions, strenuous labor, long hours in variable weather conditions, and poor sleep and nutritional patterns. Poor health has important implications for the social, economic, and environmental aspects of fisheries, where specifically, health is a pivotal asset underpinning productivity [2]. Their fishing involves dropping and raising huge nets, which is a very labor-intensive activity, for some while the boat is bucking and rolling. This constant extenuating effort has severe consequences for fishermen's health over time. The impaired physical ability of fishermen can result in potential implications not only for marine ecosystems but also for the local and national economy by decreasing the fish landings.

NATIONAL AND REGIONAL IMPORTANCE OF THE BLUE ECONOMY AND THE FISHERIES SECTOR

In the U.S., the fisheries sector provides more than 50,000 jobs and produces billions of dollars annually, reaching $27 billion in 2020, despite the advent of the pandemic. In Rhode Island (RI), the most recent available data shows that the Fisheries Sector is valued at $268.5 million and accounts for 4,381 jobs [1, 3]. In 2016, 150 commercial fishing businesses were counted in Rhode Island, and 1,229 license holders with landings (i.e., fish caught) were identified using data from the National Oceanic and Atmospheric Administration (NOAA) [3].

CONCEPTUAL FRAMEWORK: RECOGNIZING COMMERCIAL FISHERMEN'S CV RISK AND POOR QOL

There is some published data on the elevated cardiometabolic risks surrounding the labor activities of commercial fishermen, but this is still an understudied population around the globe. Fishermen's productivity can be affected by cardiovascular health (CVH) [4, 5], altered sleep patterns [6], Quality of Life (QoL) [7], and chronic stress [8]. Despite fishing being a staple of RI's BE, continuously employing workers and generating high commercial value, there are no data on the CVH or QoL of RI's commercial fishermen. Investigating factors contributing to poor CVH and QoL is pivotal for the identification of potential interventions targeted at preserving, restoring, or improving those factors. The primary aim of this study is to establish a comprehensive research framework to examine commercial fishermen's cardiometabolic health and associated protective and risk factors, quality of life, lifestyle behaviors, and productivity.

MATERIALS AND METHODS

STUDY DESIGN

This mixed-methods study was designed according to the STROBE Guidelines [9]. Given this approach, results from the qualitative phase (*qual*, Phase 1) will inform the content of the quantitative phase surveys (*QUANT*, Phase 2), which will take priority in this framework.

SETTINGS

This study will take place in Rhode Island's three ports: Galilee (Point Judith), Davisville, and Newport.

PARTICIPANTS & RECRUITMENT

Commercial fishermen will be considered eligible if they have a minimum of one year of experience in the industry. This criterion should minimize biased judgments of potentially inexperienced participants. Participants will be excluded if they present cognitive or physical impairments or disabilities, which may prevent them from adequately comprehending and responding to the questions, or engaging in behaviors that will be evaluated, such as physical activity.

There is no single database in the public domain that lists all RI's commercial fishermen. Therefore, commercial fishermen will be identified through a combined approach, including fish-selling offices and fishermen's leadership guidance, which will provide lists with the names and addresses of potential participants. The commercial fishermen will be classified in the study based on age: the young crew will be 18–24 years, the middle-aged crew will be 25–49 years, and the aging crew will be ≥ 50 years.

PHASE 1

The qualitative phase will use semi-structured interviews with focus groups to elicit information about CVH, QoL, lifestyle behaviors, and their perceptions of cardiovascular risk and protective factors. Two focus groups (6–10 participants each) are planned, and they shall include the facilitator, a note taker, 6–10 fishermen, and at least one local leader. The interviews will be recorded with permission and transcribed verbatim to inform and refine the quantitative survey components for Phase 2. This phase will rely on snowball sampling, a non-probability sampling method where currently enrolled research participants are asked to

assist researchers in identifying other potential participants.

A semi-structured interview guide for the focus groups was developed to guide facilitators through the key content areas of data collection, ensuring that the same content is discussed in each group. While the interview guide will be used to facilitate the discussion, it is not a rigid script that will be adhered to verbatim. This will ensure that the facilitators gather data on the same topics in each group while also offering flexibility to adapt and clarify questions to suit the needs of different group members. Similarly, questions do not need to be asked in any particular order. The facilitators will adapt the conversation as needed according to the narrative within each group, pursuing both the *a priori* research topics as well as any emergent relevant themes that evolve from the discussion. For example, "Have you ever had any heart problems?" is an initial question, while "Did anybody ever say that you have high blood pressure?" will serve as a follow-up.

Audio recordings will be downloaded to a HIPAA-compliant Microsoft OneDrive folder dedicated to this project. Recordings will be transcribed verbatim using a modified Jefferson transcription method, which captures vocal inflections, emphasized speech, hesitations, and audible sounds and de-identify [10]. Procedures will be undertaken throughout sampling, data collection and analysis to ensure credibility, transferability, auditability, and confirmability. Examples include sampling sufficiency and seeking negative cases, peer debriefing, bracketing, and maintaining reflexivity. Transcripts will be compared to audiotapes to ensure accuracy. NVivo 14 ™ software will be used to facilitate data coding and analysis. Transcripts and notes will be read in their entirety and then re-read multiple times while coding data.

A rigorous three-phase qualitative data analysis approach will be used:

1. Phase I — Open Coding: In vivo and descriptive coding techniques will be used to generate preliminary ideas and identify significant or recurring concepts.
2. Phase II — Content Analysis: A priori codes derived from previous research will be applied.
3. Phase III — Pattern Coding: A meta-coding schema will be developed to synthesize coding categories representing similar concepts, enabling the emergence of themes.

To minimize bias and enhance transparency, the following strategies will be implemented: (1) member checking, (2) search for discrepant evidence, (3) peer debriefing, (4) reflexive memos, and (5) an analytic audit trail.

PHASE 2

The quantitative phase sample will consist of 59 commercial fishermen whose representativeness will be ensured by a simple random sampling scheme for the age strata. This sample size calculation was based on detecting a low CVH prevalence of 5% (with 95% confidence). The participants will be recruited with the help of fishermen's leadership, which will assist researchers in locating and contacting them. They will be invited to attend a one-hour session comprising administration of questionnaires and gathering objective measures. Recruitment began in January 2024, when fishing is usually limited due to the severe weather on the U.S. East Coast, which prevents usual fishing.

VARIABLES AND MEASUREMENT TOOLS

- *Sociodemographic and clinical characterization data* will be obtained regarding age, assigned sex at birth, gender, partner status, race/ethnicity, schooling [in years], occupation, family monthly income; previous diseases and comorbidities, such as hypertension, diabetes, myocardial infarction, stroke, and medication use.
- *Ideal Cardiovascular Health*: The American Heart Association (AHA) initially defined CVH in 2010 and measured it using the Life's Simple 7 index [11]. Recently, the AHA has updated this to propose the Life's Essential 8 [12], which includes health behaviors such as diet, physical activity, nicotine exposure, and sleep, as well as factors such as body mass index, blood lipids and glucose, and blood pressure. Each metric has a scoring algorithm ranging from 0 to 100 points, allowing the generation of a new composite cardiovascular health score (the unweighted average of all components) that also varies from 0 to 100 points. The higher the score, the better the CVH, considering 100 as the ideal CVH. The metric allows the use of additional measurements, and its components will be assessed as follows:

BIOMARKERS

The dried blood spot (DBS) technique will be used to collect the samples for the biomarkers (lipids, glucose, and insulin) analyses [24]. Recent technological advancements have resulted in new opportunities in DBS methodology and the provision of reliable, quantitative data. The primary advantage of DBS is that it is less invasive than venipuncture. DBS collection involves pricking the middle or ring finger with a contact-activated micro-lancet that only triggers when positioned and pressed against the skin. Following standard procedures, the first drop of blood will be wiped away with gauze. The next drops (five, each approximately 50 µL) will be applied to filter paper. The blood drops will saturate the paper and will be air-dried for a minimum of 3 hours. These samples can be collected by non-clinical staff in community settings, easily transported, stored, and analyzed for nearly any analyte that can be measured in blood. DBS samples are stable for long periods and do not require immediate refrigeration or processing. The collection

Chart 1. Metrics and scoring criteria of CVH based on Life's Essential 8

LE8's Measures and scoring		
Health Behaviors	Diet	Self-reported daily intake of a DASH-style eating pattern. The LE8 criteria will be used to classify the diet as: 15–16 points = 100; 12–14 points = 80; 8–11 points = 50; 4–7 points = 25; 0–3 points = 0. The Mediterranean Eating Pattern for Americans (MEPA) [13] questionnaire will be added. It is a dietary screener tool designed to evaluate adherence to a Mediterranean-like eating pattern within the American population. Comprising 16 carefully crafted questions, this instrument inquires about the frequency of consumption of various food groups, including vegetables, fruits, whole grains, fish, red meat, and sweets. Respondents are prompted to indicate the number of servings they consume per day or per week for each food category. It assigns higher scores to those exhibiting greater adherence to the Mediterranean pattern. The MEPA questionnaire has undergone rigorous evaluation against validated, comprehensive food frequency questionnaires, demonstrating its capacity to provide a reasonable estimation of Mediterranean diet adherence.
	Physical activity (PA)	Self-reported minutes of moderate or vigorous PA per week, using the Godin-Shephard Leisure-Time Physical Activity Questionnaire [14]. The GSLTPAQ is a 4-item questionnaire broadly translated and validated questionnaire, with the first three questions seeking information on the number of times one engages in mild, moderate, and strenuous LTPA bouts of at least 15 min duration in a typical week. The LE8 criteria will be used to classify the PA as ≥ 150 min = 100; 120–149 min = 90; 90–119 min = 80; 60–89 min = 60; 30–59 min = 40; 1–29 min = 20; 0 min = 0.
	Nicotine exposure	Self-reported use of cigarettes or inhaled Nicotine-Delivery Systems (NDS) [15] will be asked. The smoking load will be calculated using two questions: "1. Do you smoke? If so, how many years have you been smoking? How many cigarettes do you currently smoke a day?" and "Are you an ex-smoker? If so, how long have you quit smoking? How many cigarettes did you smoke a day?". The LE8 criteria will be used to classify smoking as Never smoker = 100; Former smoker, quit ≥ 5 years = 75; Former smoker, quit 1– < 5 years = 50; Former smoker, quit < 1 year, or currently using inhaled NDS = 25; Current smoker = 0. 20 points for living with an active indoor smoker in the home must be subtracted (unless the score is 0).
	Sleep Health	Self-reported average hours of sleep per night will be obtained. Sleep duration on weekdays will be extracted from the questions "What time do you go to sleep on an ordinary weekday?" and "What time do you wake up on an ordinary weekday?" Sleep duration on the weekend will be extracted from the questions "What time do you go to sleep on the weekend?" and "What time do you wake up on the weekend?" The need for sleep to feel well-disposed upon waking up will be extracted from the question, "How many hours do you think you need to sleep to wake up in a good mood?" The LE8 criteria will be used to classify sleep health as: 7–< 9 hours = 100; 9–< 10 hours = 90; 6–< 7 hours = 70; 5–< 6 or ≥ 10 hours = 40; 4–< 5 hours = 20; < 4 hours = 0. Objective sleep position will be assessed by the neck circumference (NC), measured with upright individuals and their heads positioned in Frankfort's horizontal plane. The upper edge of the measuring tape will be placed around the neck below the prominence of the larynx and perpendicular to the axis of the neck [16].
Health Factors	Body Mass Index (BMI)	To calculate BMI, participants will be weighed, and height measured, according to the recommendations of the literature. Weight will be obtained using a portable digital body scale with a capacity of 150 kg and an accuracy of 100 g. For height measurement, a portable vertical stadiometer will be used. BMI will be calculated using the weight/(height)2 formula [17]. The LE8 criteria will be used to classify the BMI as: < 25 kg/m^2 = 100; 25.0–29.9 kg/m^2 = 70; 30.0–34.9 kg/m^2 = 30; 35.0–39.9 kg/m^2 = 15; ≥ 40.0 kg/m^2 = 0.
	Waist (WC) and hip circumference (HC)	WC and HC will be measured with an inelastic measuring tape with a capacity of 205 cm at the midpoint between the last floating rib and the iliac crest for WC and the point of greatest hip circumference for HC [18].
	Blood lipids	Plasma total and HDL cholesterol with the calculation of non-HDL cholesterol will be assayed [19]. The LE8 criteria will be used to classify lipid levels as: < 130 mg/dL = 100; 130–159 mg/dL = 60; 160–189 mg/dL = 40; 190–219 mg/dL = 20; > 220 mg/dL = 0. If the drug-treated level is reached, 20 points must be subtracted.
	Blood glucose	Fasting Blood Glucose (FBG) and HbA1c will be assayed [20]. The LE8 criteria will be used to classify glycemic serum levels as: No history of diabetes and FBG <100 (or HbA1c < 5.7) = 100; No diabetes and FBG 100–125 (or HbA1c 5.7–6.4) (prediabetes) = 60; Diabetes with HbA1c < 7.0 = 40; Diabetes with HbA1c 7.0–7.9 = 30; Diabetes with HbA1c 8.0–8.9 = 20; Diabetes with Hb A1c 9.0–9.9 = 10; and Diabetes with HbA1c ≥ 10.0 = 0. In addition, serum insulin levels will be dosed.

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Chart 1 cont. Metrics and scoring criteria of CVH based on Life's Essential 8

LE8's Measures and scoring		
	Fasting Blood Insulin	From the data of FBG and insulinemia, the HoMA2-IR of each participant, an updated version of the HoMA (Homeostasis Model Assessment), capable of quantifying pancreatic beta cell function and insulin resistance through computerized calculation will be assessed. It will be considered the cutoff point for the American population, identified as HOMA2-IR > 3.80 [20–21], to estimate the degree of insulin resistance using the HoMA Calculator v2.2.2.
	Blood pressure (BP)	Appropriately measured systolic and diastolic BPs will be obtained. BP will be measured in both arms. If there is a consistent difference between arms >10 mm Hg, the arm with the higher systolic BP will be used. A validated electronic blood pressure device that was independently assessed for accuracy, Omron HBP-1300, will be used according to specific guidelines for accurate blood pressure measurement [22–23]. The LE8 criteria will be used to classify BP levels as systolic BP < 120 mmHg/ diastolic BP < 80 mmHg (optimal) = 100; systolic BP 120–129 mmHg / diastolic BP < 80 mmHg (elevated) = 75; systolic BP 130–139 mmHg or diastolic BP 80–89 mmHg (stage 1 hypertension) = 50; systolic BP 140–159 mmHg or diastolic BP 90–99 mmHg = 25; systolic BP ≥ 160 mmHg or diastolic BP ≥ 100 mmHg = 0. 20 points are subtracted if the drug-treated level is reached.

paper is manufactured specifically for DBS and is certified to meet standards such that the level of precision and reproducibility is comparable to standard blood collection methods. Standard ELISA techniques will be used to assess these markers, as detailed in Chart 1.

The LE8 allows the inclusion of additional measurements to elucidate one's research objective better. The additional measures included in this protocol are described in Chart 2.

BIASES

Biases that might come from a limited geographical sample are foreseen. Social desirability [27] also may affect how participants respond. Although they cannot be avoided, they will be considered study limitations.

DATA MANAGEMENT & STATISTICAL ANALYSES

Survey and measurement data will be collected and stored using REDCap (Vanderbilt University/National Institutes of Health, USA). All analyses will be conducted using SPSS V29. Reliability analyses will be conducted to verify the internal consistency of the instruments/ questionnaires. It will be considered evidence of reliability if Cronbach's alpha coefficient greater than 0.7.

Descriptive statistics will characterize the sample and examine the distribution of each variable to investigate CVH, QoL, lifestyle behaviors, cardiometabolic risk, and protective factors. Frequency tables with values (n) and percentage (%) for categorical variables and measures of central tendency (mean, median) and dispersion

Chart 2. Additional measures and scoring

Additional Primary Outcomes	
Quality of Life — WHOQoL-BREF	The WHOQoL-BREF, developed by the World Health Organization (WHO), is a concise questionnaire designed to assess individuals' subjective quality of life across four key domains: physical health, psychological well-being, social relationships, and environmental conditions. With 26 items, respondents rate their satisfaction within each domain on a five-point scale. Its brevity and established reliability and validity make it a widely used tool in diverse research contexts, including clinical trials and cross-cultural studies, aimed at understanding and enhancing quality of life [25].
Fish landings	Participants will be asked to report the fish landing quantity in pounds they commonly achieve on a regular day, in a regular week, and in a regular month. They will also be asked about the same numbers, considering the winter months and if changes occur; in case of a disease or other situations that may alter the regular scenario.
Secondary Outcomes	
Lifestyle Survey	The Simple Lifestyle Indicator Questionnaire (SLIQ) will be used [26]. It is a 12-item self-administered questionnaire designed to evaluate multiple dimensions of lifestyle behaviors that impact health, particularly cardiovascular health, through five lifestyle factors: diet, exercise, alcohol consumption, tobacco use, and psychosocial stress. The responses to these 12 items are then used to calculate a single summary lifestyle score, providing a quantitative measure of an individual's overall lifestyle, ranging from 0 (very unhealthy lifestyle) to 10 (very healthy lifestyle).
COVID-19 infection and impact	Brief, open-ended questions about COVID-19 exposure and infection will be asked to understand if symptoms of long COVID affect this sample, especially regarding CVH. Participants will be asked if they have been infected with COVID-19, if they missed workdays due to the infection, if COVID-19 affected their QoL, which symptoms they experienced and how long did they last. They will also be asked about receipt of COVID vaccines and boosters and their confidence in them.

(standard deviation, maximum and minimum) for quantitative variables will be generated for the outcomes of CVH, QoL, lifestyle behaviors, and cardiometabolic risk and protective factors.

A multinomial logistic regression model will examine the associations between CVH, QoL, lifestyle behaviors, cardiometabolic risk and protective factors, and fish landings. We will categorize the lifestyle behavior variables and inflammatory markers as independent variables and the categorical LE8 CVH variable (with the "Ideal" group as the reference category) as the dependent variable. Co-variates will include age, gender, race\ethnicity, number of co-morbidities, and income. Estimates obtained from the odds ratio and effect size estimates and their respective 95% confidence intervals and p-values will be reported. Individual multiple regression models will build upon the multinomial model to examine the relationship between the previous predictors of the LE8 metric score, the LE8 metric score, and the dependent variables of QoL and fish landings.

Comparison analyses (e.g., t-tests, ANOVAs) will be conducted to assess differences between the Ideal CVH group vs. the Non-Ideal CVH group. The qualitative data will be used to explore and explain those differences more deeply and help interpret and contextualize the comparisons.

A significance level of 5% will be adopted.

ETHICAL CONSIDERATIONS

The local IRB reviewed and approved the study prior to recruitment and enrollment. Informed consent will be gained from participants before the focus groups and survey administration, and they may withdraw consent at any point in the study.

Due to its proprietary nature and ethical concerns, supporting data cannot be publicly available. Data and metadata will be made available in the institutional Research Data Repository after the project's completion and for 10 years. Data may also be made available after publication of the study results and upon reasonable request to the corresponding author.

PROTECTION OF PARTICIPANTS' RIGHTS AND CONFIDENTIALITY

To the extent that the data gathered are divulged to those who are not involved in data gathering and processing, the participants are at risk for a breach of their confidentiality. Using an electronic data capture system minimizes the use of paper forms. The potential for breach of confidentiality is further reduced using identification codes rather than names on data collection forms, digital audio recordings, interview notes, keeping hard copy data in locked file cabinets and offices, securing electronic data collected through REDCap on encrypted, password protected servers, and instituting procedures whereby a breach of confidentiality by the data gathering and clerical staff is grounds for immediate termination. Focus group participants will be reminded that the discussion is to remain confidential.

DISCUSSION

This study established a comprehensive research protocol to examine commercial fishermen's cardiometabolic health and associated protective and risk factors, quality of life, lifestyle behaviors, and productivity.

Fishermen are a group of individuals consistently exposed to various occupational hazards, including physical injuries, psychological stress, and exposure to toxins and pollutants. Despite this, little is known about their health, which puts them at risk of experiencing health inequity. The lack of research on fishermen's health has created a gap in understanding the prevalence and impact of health condition [28]. Furthermore, evidence suggests that certain subgroups of fishermen, such as those working in low-income regions or those from minority ethnic groups, may be at even greater risk due to factors such as limited access to healthcare and inadequate working conditions. Addressing this gap in knowledge and understanding is therefore crucial for promoting health equity and improving the well-being of this vulnerable population.

Because of the health disparities and hazard risks that commercial fishermen are exposed to due to their occupation, these workers should receive low-cost health insurance and access to specific adequate care to optimize their health and productivity. Nonetheless, there is a lack of specific programs addressing their health needs. The expected outcomes of this project will map the commercial fishermen's QoL, lifestyle, and CVH, highlighting the factors that negatively impact performance or serve as protective factors and the subsequent impact on the fishing economy as measured by landed fish in a pilot sample.

Commercial fishermen face specific challenges regarding components of ideal cardiovascular health. Research from other countries revealed that they eat and sleep poorly and are under chronic stress due to weather, potential hazards, productivity goals, and low income [29–31]. However, no studies have been conducted with RI commercial fishermen. As a conceptual innovation, the results of this project will establish a novel link between RI nursing research, healthcare, and fishermen; by investigating the factors that potentially impair their CHV and QoL among a small and specific population responsible for providing food and profits for a massive piece of the blue economy.

Nationwide, this initiative is also a pioneer. Although: 1) there are exceptional federal regulations, such as

the National Oceanic and Atmospheric Administration and the National Institute for Occupational Safety and Health (NIOSH), that provide information and policies focused on environment safety, occupational safety risk, and nature preservation; and 2) there was one initiative describing specific economic outcomes of RI commercial fishermen; still little is known about the health of and care provided to the commercial fishermen. On top of that, no relationship between their health and how it affects the BE was investigated. Our technical innovation will rely on the possibility of establishing local policies focused on optimizing fishermen's health and productivity.

This project is designed considering the 2030 Agenda for Sustainable Development (SD) [32] and addressing SD Goals #3 (Good Health & Well-Being) and #8 (Decent Work and Economic Growth). Locally, it relates to one of the four economic development goals proposed by the RI-BE Technology Cluster Coalition 2022–2025, Goal #3 — Increase the productivity of the existing workforce [33]. The expected outcomes of this project will map the commercial fishermen's QoL, lifestyle, and CVH, highlighting the factors that negatively impact performance or serve as protective factors and the subsequent impact on the fishing economy as measured by landed fish in a pilot sample. In January 2021, Public Law 116–289, entitled "Young Fishermen's Development Act" [34] was approved by Congress, with a focus not only on training but also on assisting the next generation of commercial fishermen. However, no actions locally or nationally have been conducted to safely ensure commercial fishermen's productivity.

Although some states have organizations dedicated to improving the health, safety, and economic security of commercial fishermen and their families, no specific initiative is provided by Rhode Island's government. Because of the health disparities and hazard risks that commercial fishermen are exposed to due to their occupation, these workers should receive low-cost health insurance and access to specific guideline-based care to optimize their health and productivity. Nonetheless, there is a lack of specific programs addressing their health needs. This proposal also incorporates community engagement, which will facilitate the meeting between the research team and the commercial fishermen and host the location for surveys and dried blood spot sample collection.

This project provides unique opportunities for training and professional development. The research team is comprised of skilled professionals in nursing, marine science, and public health, which creates a distinct opportunity for comprehensive training and professional development. This rare interdisciplinary composition offers the chance for each team member to contribute their specialized expertise while simultaneously fostering a collaborative environment conducive to shared learning. Our diversity in backgrounds and perspectives provides a rich platform for cross-disciplinary initiatives, promoting a holistic understanding of research methodologies, data analysis, and the integration of findings.

By combining the collective knowledge within our team, tailored training programs may be developed, aligning the specific needs of nurses, marine specialists, and public health professionals, enhancing their skill sets, and contributing to the overall success of community health research.

CONCLUSION

This framework details an exploratory protocol to investigate cardiovascular health (CVH), quality of life (QoL), and productivity of commercial fishermen through a two-phase study. The combination of the two phases forms a mixed methods study that 1) corresponds to the initial phase of the Intervention Mapping strategy, aimed at establishing needs assessment, and 2) will inform the development and testing of a behavioral intervention for the prevention of cardiometabolic diseases and the reduction of CV mortality among RI commercial fishermen.

ARTICLE INFORMATION AND DECLARATIONS

Data availability statement: Due to its proprietary nature and ethical concerns, supporting data cannot be publicly available. Data and metadata will be made available in the University of Rhode Island Research Data Repository (DigitalCommons@URI) after the project's completion and for 10 years. Data also may be made available after publication of the study results and upon reasonable request to the corresponding author.

Ethics statement: The University of Rhode Island Institutional Review Board reviewed and approved the study prior to recruitment and enrollment. Informed consent will be gained from participants before the focus groups and survey administration.

To the extent that the data gathered are divulged to those who are not involved in data gathering and processing, the participants are at risk for a breach of their confidentiality. Using an electronic data capture system minimizes the use of paper forms. The potential for breach of confidentiality is further reduced using identification codes rather than names on data collection forms, digital audio recordings, interview notes, keeping hard copy data in locked file cabinets and offices, securing electronic data collected through REDCap on encrypted, password protected servers, and instituting procedures whereby a breach of confidentiality by the data gathering and clerical staff is grounds for immediate termination. Focus

group participants will be reminded that the discussion is to remain confidential.

Author contributions: According to the Contributor Roles Taxonomy (CRediT) initiative: TMSJ: Conceptualization, Funding Acquisition, Investigation, Methodology, Project administration, and Writing — original draft, review, and editing; ADC: Validation and Writing — review, and editing; JMC: Supervision, Validation, and Writing – review and editing; KC: Investigation and Writing — review, and editing; KA: Supervision, Funding Acquisition, Methodology, Project Administration, and Writing — review and editing.

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