

The Ocean Decade— Opportunities for Oceans and Human Health Programs to Contribute to Public Health

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The COVID-19 pandemic reminds us that our health is vulnerable to immediate threats emerging from the ecosystems we inhabit. More insidious global threats include the increasingly overt consequences of climate change, biodiversity loss, and pollution. As the largest connected ecosystem on Earth, the global ocean exerts a greater influence than any other on our climate and weather, affecting global food production and international trade. Much more importantly, human health is intricately linked to “ocean health.”^{1,2}

The United Nations has announced the Decade of Ocean Science for Sustainable Development from 2021 to 2030 (<http://bit.ly/3kePT9f>). Public health and medical professionals should embrace this timely opportunity to transform the way we interact with our seas. We call for a revitalized, inclusive endeavor to repair the damage we have done during our careless past and to protect the myriad benefits available in the future. Making amends will necessitate bringing together ocean researchers, health professionals, coastal

communities, policymakers, and other stakeholders to work on delivering a resilient, sustainable ocean that fosters improvements in public health.

DANGERS AND BENEFITS FROM THE DEEP

Dangers to health and well-being arising in coastal waters, regional seas, and the global ocean have long been recognized by marine scientists but less so by the medical and public health community.¹ Our past and present use of our seas as a waste sink has already had severe, wide-ranging effects on sea life but also on humans. The mosaic of risks and occurrences includes drowning, injury, loss of livelihood, and property damage from extreme weather events, tsunamis, and coastal flooding, together with exposure to harmful algal blooms, chemical pollution, and microbial pollution. These threats are compounded by the sea-level rise, ocean warming, acidification, and deoxygenation associated with global change.

Worldwide, more than 250 million clinical cases of gastroenteritis and respiratory disease are linked annually to swimming in contaminated seas.^{1,3,4} Other direct health threats arise through disease transmission and ingestion of toxic substances. For example, in indigenous Arctic communities, persistent organic pollutants accumulate to dangerously high levels. Indirect health effects arise as fisheries collapse and livelihoods are damaged, especially in vulnerable coastal communities. Human activities continue to degrade estuaries and coasts; and they have even contaminated the deep abyss and polar seas, leading to the destruction of habitats and severe losses of biodiversity.^{1–4} Further adverse consequences for humanity are likely to follow.

But it is not all bad news. Healthy oceans foster healthy people. For more than 4.5 billion people, approximately 15% of their daily per capita intake of animal protein comes from marine products.⁵ Seafood provides a source of micronutrients and omega-3 fatty acids essential for good physical and mental health. Other natural extracts from marine organisms have been turned into disease treatments (e.g., for cancer) or used in diagnostic tools (e.g., key enzymes incorporated into tests for COVID-19 and other viral diseases; <https://bit.ly/37Ekc4b>).

The lockdowns during the current pandemic have been a vivid reminder of our huge reliance on being able to visit natural settings, in particular coastal areas, for health and well-being. Studies over the past 10 years have demonstrated that spending time in high-quality “blue” spaces (through leisure activities or living in a coastal environment) directly supports and enhances health and well-being, combatting obesity and mental health problems, particularly in deprived populations.⁶ This highlights an enormous potential for these well-being promotion initiatives and healthcare interventions to address both preexisting and emerging health issues beyond the lifetime of the pandemic.

LAUNCHING A PLAN OF ACTION

During the past three decades, Oceans and Human Health (OHH) researchers have explored how the health of the ocean influences the social and environmental determinants of human health and well-being. This is a practical attempt to engage public health and biomedical professionals with marine and more general environmental

scientists to create evidence-based policies and actions in partnership with affected communities and decision makers (<https://bit.ly/3qXBast>).¹

Starting in the United States in the 1990s (<https://bit.ly/3aj1nP4>), the OHH approach has provided a method for setting priorities for adaptation and mitigation as the global marine ecosystem transforms. In Europe, the Horizon 2020 SOPHIE Project (<https://sophie2020.eu/strategic-research-agenda>) has identified three key areas where interdisciplinary teams from the OHH community can push forward innovative actions with diverse multilevel stakeholders to respond to current and future circumstances:

- sustainable seafood for healthy people;
- biodiversity, biotechnology, and medicine; and
- blue spaces, tourism, and well-being.

An example of innovative action is the OHH Chair, jointly created in 2018 by the City of Roses, the University of Girona, the Fishermen Association of the Town of Roses, and the Fishmongers Guild of Catalonia, with the support of diverse publics (<http://www.oceanshealth.udg.edu/en/where-is-it.html>). To facilitate such sustainable management in partnership with local citizens, information systems need to be established to measure and link ocean–human health indicators, providing baselines and enabling changes to be monitored over time.

The drama of social injustice is also being played out in the OHH arena. Globally, small island nations, low-income countries, and poor vulnerable populations living along coastlines are already experiencing the often dangerous consequences of the climate and

biodiversity crises. They have contributed the least to the problem but are the most at risk, and they are without the resources to respond.¹ Nevertheless, as the current global pandemic is demonstrating, when humanity faces a great challenge, extraordinary measures can be taken. There is now a tremendous opportunity and public momentum for health professionals to join with ocean researchers to help policymakers, the business community, and the wider public to address systemic global challenges in a new way (<http://bit.ly/2ZDFMS3>).⁷

We need international alliances, transdisciplinary collaborations, and global governance that support innovative, systemic ways of managing ocean resources. Examples include natural marine products as ecological alternatives to plastics, marine renewable energy as an alternative to fossil fuels, and marine protected areas for restocking fisheries and helping biodiversity recover. The last of these can also serve as natural blue infrastructure to protect against climate change, while giving people access to nature to promote their physical and mental well-being.^{1,6,7}

These first steps toward integrating public health into OHH will need to involve us all (see [box](#) on pp. 830–831). Success can be achieved only by instilling proenvironmental behavior at individual and community levels and by involving affected communities and stakeholders in participatory governance to develop local solutions to the issues they face. The personal meaning of the challenges that communities face and the sense of personal vulnerability can generate greater awareness and create engagement. Providing practical solutions locally can empower sustainable actions, especially when supported by national and international higher-level

Ideas on Possible First Steps to Improve Ocean and Human Health (OHH) Interactions for the Public Health and Other Communities, Not Exhaustive

Actors	Possible (First) Steps ^a
Medical and social care sector (doctors, nurses, mental health experts, social workers), public health experts	• Integrate with individual and community health promotion activities, “Blue prescriptions” (and monitoring) ^b
	• Include OHH in medical curriculum
	• Work with environmental and city planners to seek cobenefits in planning for humans and the environment
	• Get involved in advice and activities at local, national, and global levels
Researchers	• Build on the OHH Strategic Research Agenda (a first step) ^b
	• Research the evidence gaps and provide evidence to policymakers
	• Promote transdisciplinary training
	• Design and support implementation of dedicated OHH indicators, data streams, and repositories
	• Get involved in community cocreation and listen!
Citizens (local residents and tourists)	• Get involved in science advice activities at local, national, and global levels to facilitate evidence-based policy
	• Enjoy the sea, coasts, and blue spaces safely and sustainably
	• Encourage school projects on ocean literacy, respect for the sea, sustainability, and citizen responsibility and involvement
	• Participate in clean-up activities (e.g., Plogging, Sweden; Surfers Against Sewage, United Kingdom)
	• Seek out science activities near your home involving citizens (monitoring, counting)
Private organizations (tourism operators, holiday rentals, camp sites, etc.), businesses, and nongovernmental organizations	• Listen to stories from the elderly and others about the sea
	• Inform clients on what a stay by the sea can do for their health and the importance of ocean health for their health
	• Involve clients in citizen science projects
	• Ask their feedback on their experiences including impact on their health and well-being
Large international and local businesses	• Share these experiences (Web site, OHH platform)
	• Review and act on the impacts of supply chain, waste, and other business activities on ocean health
	• Share these actions within and beyond the individual business (Web site, OHH platform)
	• Support employee and local community activities that support ocean health
Local planners and policymakers	• Join with other similar businesses and supply chains to share best practices and drive innovation toward a healthy ocean
	• Integrate OHH as part of your local programming
	• Engage in listening and cocreation events with local citizens

Continued

policies and regulatory frameworks (<http://bit.ly/3btc7Ao>).

SUMMARY

The devastating COVID-19 pandemic and the perilous state of our seas have made clear that we share a single planet with a single global ocean. Our moral compass points to addressing the myriad threats and opportunities we encounter by protecting and providing for everyone, both rich and poor, while learning to sustain all ecosystems. The UN Ocean Decade is a chance to truly transform the way we interact with the global ocean. Given how critical the link is between the oceans and human health and how important the ocean is for humans, achieving the aims of the Ocean Decade should not be left to just the ocean community. By working together, we add impetus to finding powerful, effective, new ways to foster a step change in public health. **AJPH**

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Actors	Possible (First) Steps ^a
National and regional ministries (health, water, environment, fisheries and agriculture, industry)	• Secure equitable access to the coasts and sea in spatial plans with environmental sustainability and quality at the forefront
	• Work with public health and environment officers on benefits and risks from the ocean
	• Monitor continuously the effects on downstream usages in policy development (system-based approach) on health of humans and the environment
	• Assess environment and human health in collaboration with citizens and experts
Policymakers	• Develop a common language and work with diverse stakeholders
	• Prioritize the OHH agenda and work on awareness across different directorates
	• Develop a common language on OHH
	• Facilitate interdisciplinary discussions and funding for OHH research and training cocreated with communities
Diverse groups	• Include the interdependencies of environment and health in all policy development
	• Consider coming together to propose specific local, regional, and global UN Ocean Decade Actions (e.g., networks, dedicated resources, research programs, etc.) ^c
^a Examples can be found at https://sophie2020.eu ; https://en.unesco.org/biosphere ; https://www.blueclimateinitiative.org . ^b Examples can be found at https://sophie2020.eu/strategic-research-agenda . ^c Examples can be found at https://www.oceandecade.org/events/134/United-Nations-Decade-of-Ocean-Science-for-Sustainable-Development-2021-2030-Call-for-Decade-Actions-No-012020 .	

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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