

Health Risks on the Binational Pacific Coastline

San Diego - Tijuana - Playas de Rosarito

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INTRODUCTION

Coastal water pollution is a significant public-health concern. Exposure to polluted waters is linked to over 100,000 illnesses annually worldwide and can affect inland populations through aerosolized sea spray. In the San Diego–Tijuana region, Tijuana has experienced rapid growth from immigration, deportees and U.S.-owned factories, straining its infrastructure. Local wastewater treatment plants are not functioning properly, causing roughly 40 million gallons of raw sewage to be discharged into water bodies each day. Political tensions and a lack of infrastructure upgrades on both sides of the border mean chronic contamination persists. Air and water pollutants pose risks for those who live, work or visit this coastline. Suboptimal infrastructure facilitates, the spread of pollutants like fecal bacteria, industrial runoff, microplastics and stormwater, degrade water quality. This binational coastline includes major waterways such as the Tijuana River and the Pacific Ocean and has been declared a state of emergency due to persistent contamination. This study aimed to assess health risks associated with proximity and interactions with the San Diego–Tijuana–Rosarito coastline in 2024-2025.

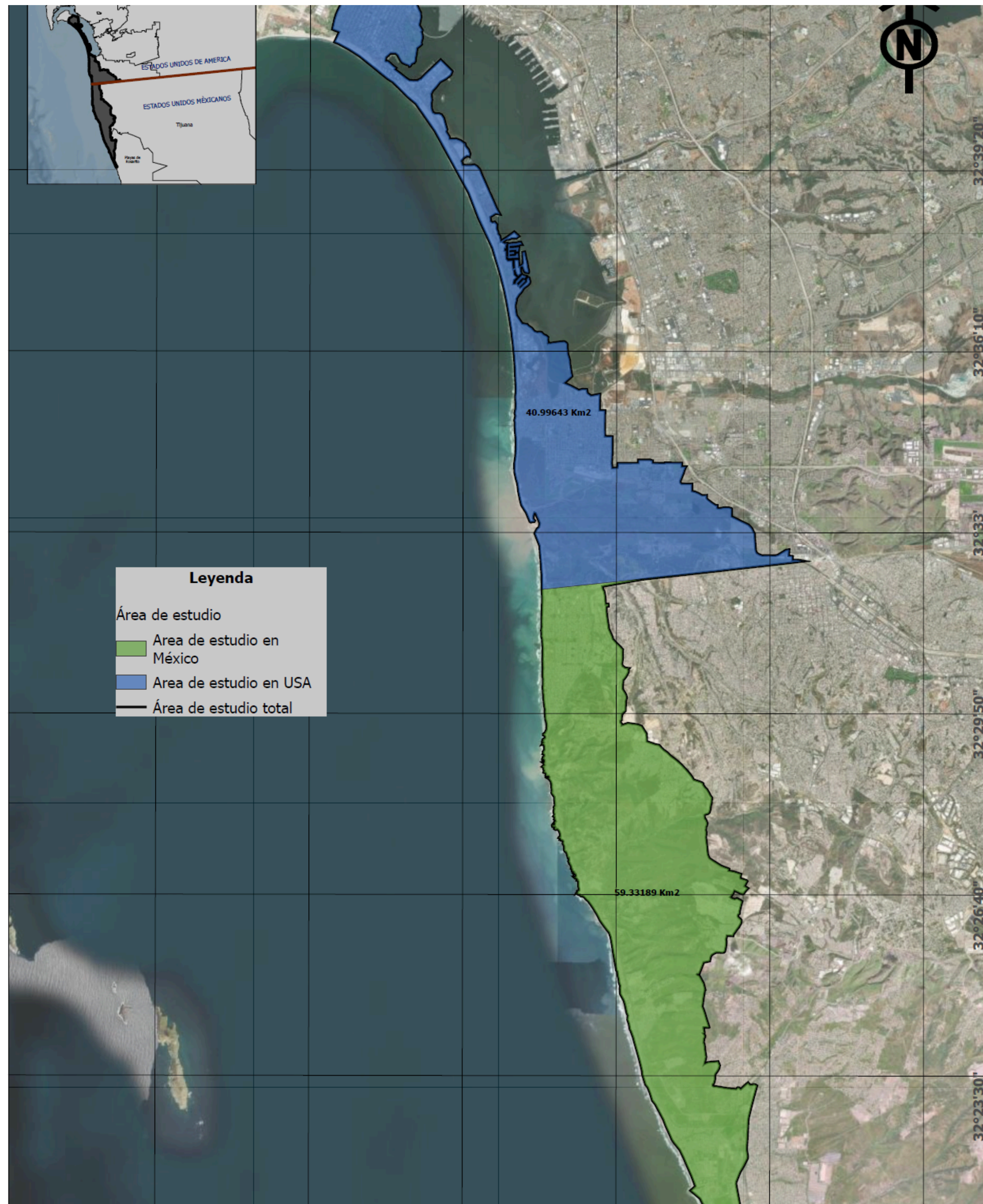


Figure 1. Study Area: Binational Pacific Ocean Coastline in San Diego, Tijuana and Rosarito

METHODS

A cross- sectional study was conducted to assess health risks among adults (18+) who lived, worked or spent time in the coastline area of San Diego, CA, and Tijuana and Playas de Rosarito in Baja California, Mexico. The research was a component of the ‘One Coastal Community’ initiative led by community organizations (Proyecto Fronterizo de Educación Ambiental and San Diego Coastkeeper), and it formed part of the Socio-Environmental Tijuana River Project. This study was funded by CSUSM and the San Diego Foundation and was reviewed by the CSUSM IRB (#2260867). **Study area:** 102.4 km² of coastline (59.3 km² in Mexico, 43 km² in the U.S.) (Figure 1). Twenty-five beaches and coastal areas were included (10 in San Diego, 10 in Tijuana and 5 in Playas de Rosarito). **Dataset:** An online survey (English and Spanish) was hosted on the CSUSM Qualtrics platform during 2024-2025 for adults who consented to participate. Survey content included demographics, interactions with the Pacific Ocean coastline, perceptions of infrastructure and environment, health conditions, and knowledge/attitude/awareness items. **Secondary data:** Enterococci averages (MPN/100 ml) per beach in the period Nov 2024–Jul 2025 were collected from official government agencies in both countries (MX: COFEPRIS and SEMARNAT, US: San Diego County Department of Environmental Health and Quality).

RESULTS

The online survey yielded 349 respondents, Forty-six percent lived in Tijuana, 37 % in San Diego, 13 % in Playas de Rosarito, and 2 % in multiple locations. Women comprised 66 % of participants. The average age was 39.4 (± 15) years, and average schooling was 15 (± 2) years. Sixty-four percent of participants were Mexican, and 41 % U.S. citizens. **Coastline use:** Most participants (68 %) visited the coastline for recreation; 48 % lived within 2.5 km of the coast and 23 % worked or studied there. Most frequent activities conducted in the coastline in the last month include walking/running (73 %), eating (26%), sitting in public spaces/sunbathing (21%), and practicing aquatic activities/sports (11%). Average visit duration was 4 (± 5) hours. Most visits occurred during the day (32 %), followed by afternoons (16 %). **Perceived environmental risks:** Participants observed a mean of five unpleasant situations per visit, including urban garbage/littering (71 %), wastewater/sludge discharges (63 %), unleashed dogs (46 %), and dangerous sharp objects (37 %). **Water quality:** Most of the beaches/coastal areas reported enterococci averages over the recommendations for both US and Mexican environmental standards for human contact. **Exposure and health outcomes:** Contact with ocean water and sand was most common on feet (55 % water, 67 % sand) and legs (42 % water, 47 % sand). Within the past month, 43 % reported allergic conditions (respiratory, eye or skin), and 41 % reported infections (ears, eyes, gastrointestinal, urinary tract or skin/soft tissue). System-specific prevalence: respiratory conditions were most common (41 %) followed by gastrointestinal (24 %) and eye conditions (17%) (Figure 2). Asthma was the most frequent family diagnosis in the past year (8 %). **Associations:** Respiratory conditions were associated with visits to beaches with high enterococci levels (p=0.004), frequency of visits to the coastline (p=0.006), and practicing sports in the coastline (p=0.043). Eye conditions were associated with frequency of visits (p=0.029) and residency in in the costaline (p=0.064). Observation of decomposing animals and indistrual discharges were in the beach/coastal areas visited last month were associated with respiratory (p=0.005 and p=0.009) and gastrointestinal (p=0.001 and p=0.010) conditions.

Health conditions in the past month

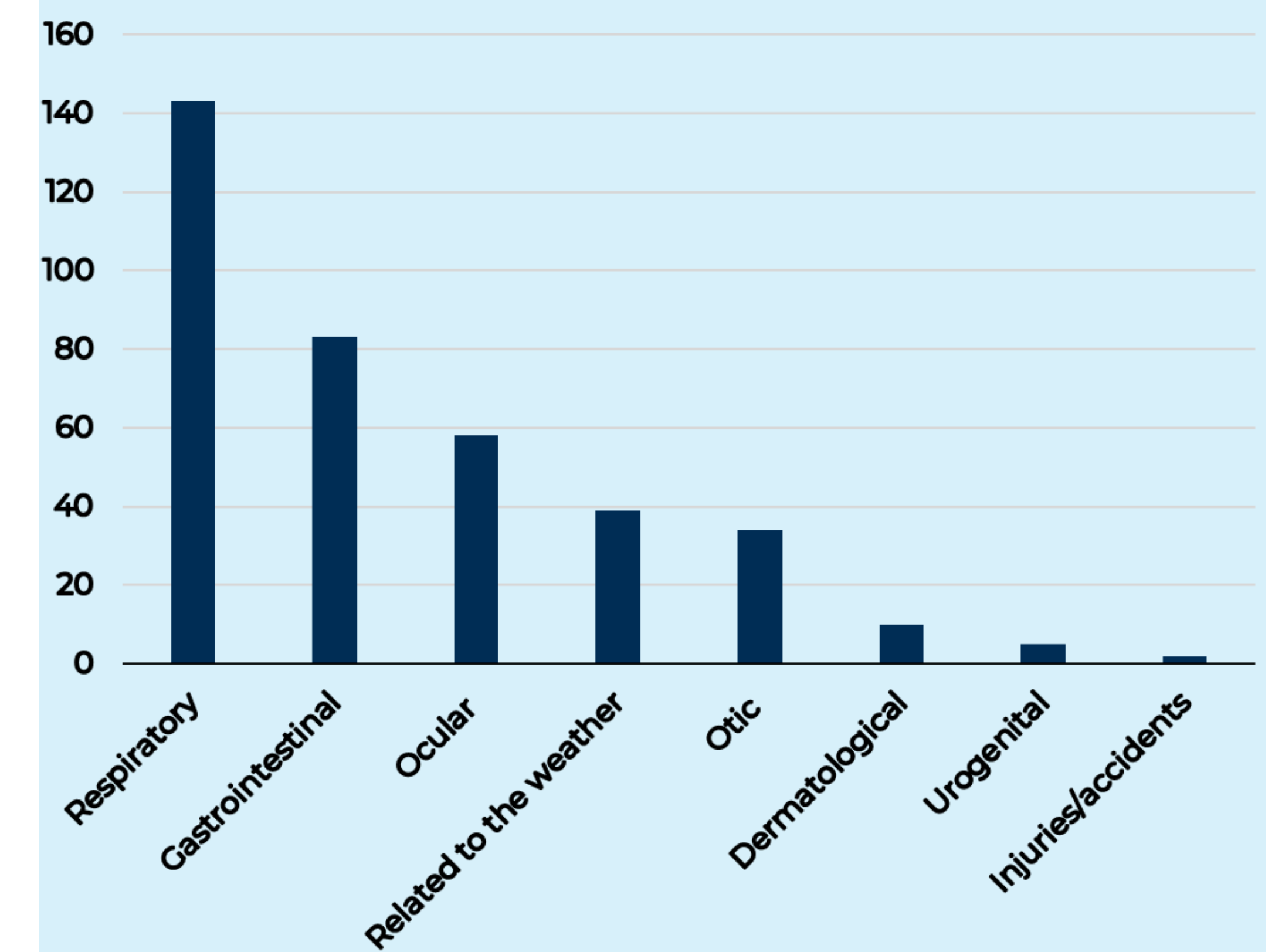


Figure 2. Self-reported health conditions

DISCUSSION

Respondents often reported respiratory, gastrointestinal, ocular and otic conditions associated with exposure to environmental exposure. These rates match reports from Imperial Beach/Tijuana River Valley, where over 60% had cough or sore throat irritation and over 30% had rashes, far above state averages. Meta-analyses show that swimmers have more than twice the risk of gastrointestinal conditions and a 78 % higher risk of respiratory conditions compared to non-swimmers. Tijuana’s growth, poor drainage, and sewage and industrial discharge have raised river and coastal pollution from human waste, industry, and storm runoff. This study underscores the overlap between self-reported illness, body contact with polluted beach water and environmental factors. Limitations include self-reported health outcomes and lack of independent verification. Nevertheless, the study is the first to document health risks in a binational population along the U.S.–Mexico Pacific Ocean coastline. Longitudinal studies are needed to assess dose-response associations between environmental interactions with health outcomes. The convergence of survey responses and secondary environmental data provides a foundation for future research and policy. Recommendations include health education, real-time environmental alerts and binational collaboration on coastal water-quality monitoring.

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