The Impacts of Beach Pollution

Polluted beachwater makes swimmers sick and hurts coastal economies. Illnesses associated with polluted beachwater include stomach flu, skin rashes, pinkeye, respiratory infections, meningitis, and hepatitis. In addition to the health risks from polluted beachwater, economists have estimated that a typical swimming day is worth approximately $35 to each individual, so depending on the number of potential visitors to a beach, the “consumer surplus” loss on a day that a beach is closed or under advisory for water quality problems can be quite significant.

HEALTH RISKS

Diseases Caused by Pathogens in Bathing Waters

Polluted waters may contain disease-causing organisms called pathogens. The most common types of pathogens are those associated with human and animal waste, including bacteria, viruses, and protozoa. For instance, giardiasis is caused by the protozoan *Giardia lambia*, North America’s leading reported intestinal parasite.¹ Swimmers in sewage-polluted water can contract any illness that is spread by fecal contact, including stomach flu, respiratory infection, and ear and skin infections. Most swimming-related illnesses last from a few days to several weeks, but in some cases pathogens may cause severe, long-term illness or even death. Sensitive populations such as children, the elderly, or those with a weakened immune system are particularly at risk for long-term effects. For example, research has shown that children under the age of 9 have more reports of diarrhea and vomiting from exposure to waterborne pathogens than any other age group, with at least a twofold increase occurring over the summer swimming months.² There is usually a delay of several days to two weeks between contact with contaminated water and expression of symptoms, and most people who get sick from swimming are not aware of the link.
urban runoff. The study found an increase in risk of illness associated with swimming in ocean waters contaminated by sewage treatment plant outfall. While these estimates are subject to a great deal of uncertainty, they provide insight into the potential for underreporting of beach-related illnesses.

Contaminated Runoff and Incidence of Disease
Discharges of polluted urban runoff result in elevated bacteria levels and increased illness rates among swimmers, and the association between heavy precipitation (leading to increased runoff) and waterborne disease outbreaks is well documented. For instance, in a 2012 California study: Investigated surfers’ risk of gastrointestinal illness during dry weather and post-storm conditions in the coastal waters of Southern California based on enterococcus (ENT) and fecal coliform (FC) concentrations in the water. We also found, using ENT, some beaches have significantly elevated health risks for surfers after a storm event.

A large-scale 1995 epidemiological study, also in California, investigated possible adverse health effects associated with swimming in ocean waters contaminated by urban runoff. The study found an increase in risk of illness associated with swimming near flowing storm drain outlets in Santa Monica Bay, compared with swimming more than 400 yards away. For example, swimmers near storm drains were found to have a 57 percent greater incidence of fever than those swimming farther away.

Climate Change and Incidence of Disease
Climate change is expected to increase the incidence of diseases contracted by swimmers. This is because water is more likely to become contaminated with pathogens in areas where there are larger storm events with increased runoff and combined sewer overflows (CSOs), and also because warmer waters will allow pathogens to expand their range. Pathogens such as Cryptosporidium parvum and Giardia lamblia, which are associated with polluted runoff and CSOs, could increase in recreational waters in areas where climate change causes increased precipitation and runoff. An article in Climate Research notes that, although there are uncertainties, “a wetter climate in the [mid-Atlantic region] could lead to higher [Cryptosporidium] loads in water.” A major cryptosporidium outbreak in Milwaukee in 1993, which killed 54 people and sickened more than 400,000, occurred after stormwater compromised the efficiency of a drinking water treatment plant.

The bacterium Vibrio cholerae, which causes cholera, is an example of a pathogen that presents an increased threat to humans as a result of climate change. Extreme weather events and warmer waters can foster growth of the bacterium—one study found that V. cholerae was up to nearly 20 times as likely to occur at a temperature of 19°C or higher than at lower temperatures. Increased freshwater runoff, high in nutrients and low in salinity, also may favor the growth of V. cholerae. As one study of Chesapeake Bay concluded, “increased climate variability, accompanied by higher stream flow rates and warmer temperatures, could favor conditions that increase the occurrence of V. cholera in Chesapeake Bay.”

Threats to Swimmers from Harmful Algal Blooms
Harmful algal blooms (HABs), often called red tides, are a growing problem in surface waters where nutrient-rich pollution can spur algal growth. Several species of phytoplankton produce potent toxins that can make people sick if they are exposed to contaminated water or if they eat contaminated fish or shellfish. These toxic organisms are a natural part of the phytoplankton community, but when conditions are right, they experience a rapid growth in numbers, resulting in a “bloom.” HABs can last for days, weeks, or months and cause serious and potentially life-threatening human illnesses that have a slew of symptoms, including diarrhea, nausea, vomiting, abdominal cramping, chills, diminished temperature sensation, muscle aches, dizziness, anxiety, sweating, seizures, numbness and tingling of the mouth and digits, and paralysis, as well as cardiovascular and respiratory symptoms. Approximately 10 percent of all food-borne disease outbreaks in the United States are caused by eating seafood contaminated by algal toxins. Toxins produced by harmful algae can aerosolize and cause respiratory distress even in beach visitors who do not enter the water.

The incidence of HABs has increased dramatically over the past 30 years. Indeed, analyzing data over nearly 50 years from the southwest coast of Florida, researchers at the University of Miami determined that Karenia brevis red tides are occurring with greater frequency, closer to shore,
Coastal tourism, attributable in part to clean beaches, generates substantial revenues for state and local government, as well as for businesses lining the coasts. Economists estimate that a typical swimming day is worth approximately $35 to each individual. Depending on the number of potential visitors to a beach, this “consumer surplus” loss can be quite significant. For example, one study estimated economic losses as a result of closing a Lake Michigan beach due to pollution could be as high as $37,030 per day. Similarly, a Southern California study concluded that each year fecal contamination at Los Angeles and Orange County beaches caused between 627,800 and 1,479,200 excess gastrointestinal illnesses with a public health cost of $21 million to $51 million.

Another example of the potential for economic harm from beach pollution is found in Florida. One analysis of southeast Florida estimated that there were more than 18 million “person-days” of visits to natural reefs in four counties, leading to $2.7 billion in spending and more than 40,000 full- and part-time jobs. Yet coral reefs are adversely impacted by a combination of rising temperatures, increasing nutrients, and pathogen pollution from sources such as untreated or inadequately treated sewage. Fecal contamination from sewage in the Florida Keys is thought to be a major source of disease in coral.

Investments in improving water quality result in greater economic returns. For instance, a 2007 Brookings Institution study concluded that the $26 billion Great Lakes Regional Collaboration Strategy to clean and preserve the Great Lakes would result in present-value economic benefits of over $50 billion in long-term benefits; and between $30 and $50 billion in short-term multiplier benefits. A 2007 study by the National Oceanic and Atmospheric Administration found that an improvement in water quality in Long Beach, California, to the healthier standards of Huntington City Beach would create $8.8 million in economic benefits over a 10-year period. A similar 2001 study compared the 1996 water quality of the Chesapeake Bay with the quality it would have had if legislation to clean the waters had never been passed. The study estimated that the water quality improvements increased annual boating, fishing, and swimming revenue by $357.9 million to $1.8 billion.

Some areas either do not monitor their beaches or do not close them when water quality fails to meet standards. This can result in lower short-term losses for businesses in the area, but it also means that those who get sick will incur medical costs and lost workdays as a result. According to the Centers for Disease Control and Prevention, hospitalizations for three common waterborne diseases—Legionnaires’ disease, cryptosporidiosis, and giardiasis—cost the health care system as much as $539 million annually. Cleaning up the sources of pollution so that beachwater does not pose a health risk is the optimal solution. In the meantime, protecting public health will require improved beachwater monitoring and closing beaches when contamination is detected or suspected, rather than allowing people to swim and get sick. Given the large number of people using beaches and the substantial income from coastal tourism, the cost of monitoring programs is reasonable.
Questions: What are the dangers of Harmful Algal Blooms?


12. Ibid.


26. Ibid.


