

Supplementary Materials for

Health promotion at the beach: lessons learned from the “safe beaches” education project

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Appendix A

Topics covered in the educational sessions organized by health belief model factors.

APPENDIX A

Topics covered in the educational sessions organized by health belief model factors

NUTRITION AND FEEDING

Perceived susceptibility	Perceived severity	Perceived benefits	Perceived barriers
<p><i>Foodborne illnesses</i> Warmer temperatures accelerate the growth of harmful bacteria such as Salmonella, E. coli, and Listeria. Improper storage of perishable foods can lead to contamination and illness.</p> <p><i>Dehydration risks</i> Inadequate hydration due to hot weather can cause dehydration, particularly in children, the elderly, and outdoor workers.</p> <p><i>Cross-contamination</i> Beach picnics often involve shared utensils and close proximity of raw and ready-to-eat foods, increasing the risk of cross-contamination.</p>	<p><i>Dehydration</i> The summer heat increases the risk of dehydration, especially if people are consuming salty foods (like chips or nuts) without drinking enough water. Dehydration can result in dizziness, fatigue, and heat-related illnesses.</p> <p><i>Heat-related illnesses</i> Consuming heavy or greasy food in hot weather can cause discomfort, indigestion, or bloating. This can be exacerbated by the inability to rest in a comfortable, air-conditioned space after eating.</p> <p><i>Dehydration consequences</i> Studies have shown that even mild dehydration (1-2% body weight loss due to fluid loss) can affect mood, concentration, and alertness. Dehydration can negatively impact physical performance. A study in the Journal of Applied Physiology found that dehydration of as little as 2% body weight can significantly impair endurance performance, strength, and cardiovascular function, especially in hot weather.</p>	<p><i>Prevention of dehydration</i> Proper hydration through water and hydrating foods (like fruits and vegetables) helps prevent dehydration, which is common during summer beach activities. Staying hydrated supports bodily functions, including temperature regulation, digestion, and circulation.</p> <p><i>Energy boost</i> Consuming the right balance of foods – such as healthy snacks like nuts, whole grains, fruits, and vegetables – can help maintain steady energy levels throughout the day, especially during outdoor activities like swimming, volleyball, or beach walks.</p> <p><i>Balanced nutrition</i> Eating a variety of nutritious foods ensures the body receives the necessary vitamins, minerals, and nutrients to stay healthy in the hot weather. For instance, foods high in antioxidants (such as berries) and healthy fats (like avocado or nuts) help combat oxidative stress from sun exposure.</p> <p><i>Prevention of heat-related illnesses</i> Eating light and nutritious meals instead of heavy, greasy foods helps avoid digestive discomfort in hot weather and reduces the risk of heat-related illnesses, such as heat exhaustion, which can result from consuming overly salty or heavy foods.</p>	<p><i>Heat and spoilage</i> One of the most significant barriers to proper food management at beaches is the hot weather. The heat can cause perishable foods, such as dairy, meat, or salads, to spoil quickly, increasing the risk of foodborne illness. Maintaining proper food safety in high temperatures without refrigeration can be a significant challenge.</p> <p><i>Sand and dirt contamination</i> Beaches are often sandy and windy, which increases the risk of food contamination. Food can easily become contaminated by sand, dirt, or seawater, making it unappetizing or unsafe to eat. This is a major concern for those trying to keep food clean and hygienic while enjoying outdoor activities.</p> <p><i>Limited access to facilities</i> Many beaches lack proper facilities like tables, shaded areas, or trash disposal bins. This makes eating and managing food inconvenient and uncomfortable. Without adequate facilities for preparing and eating meals, people may be discouraged from bringing proper food or snacks.</p>

SUN EXPOSURE ON BONE HEALTH

<p><i>Vitamin D production</i> Sunlight is a major source of vitamin D, which is essential for calcium absorption and bone health. When skin is exposed to sunlight, it synthesizes vitamin D, which helps in the proper mineralization of bones, improving bone density and strength.</p> <p><i>Prevention of osteoporosis</i> Adequate levels of vitamin D can help maintain strong bones and prevent conditions like osteoporosis. The vitamin enhances calcium absorption in the intestines, allowing for the proper development and maintenance of bone tissue. Without sufficient vitamin D, bones may become brittle and prone to fractures.</p> <p><i>Sun exposure and vitamin D deficiency</i> For people who have limited sun exposure – due to living in areas with low sunlight, using sunscreen, or spending most time indoors – the risk of vitamin D deficiency increases. This deficiency can lead to a higher susceptibility to osteoporosis, particularly in older adults and individuals with darker skin tones, as they produce less vitamin D from sunlight.</p>	<p><i>Increased risk of osteoporosis</i> Without adequate sun exposure, individuals are at risk of vitamin D deficiency, which can directly impact bone health. Vitamin D is essential for calcium absorption; without it, bones cannot absorb enough calcium, leading to a decrease in bone density and an increased risk of osteoporosis. People may perceive a high severity of osteoporosis if they are aware of how essential vitamin D is for the maintenance of strong bones.</p> <p><i>Impaired bone mineralization</i> When the body doesn't receive enough vitamin D, bones may become weak and more prone to fractures, which are hallmark symptoms of osteoporosis. Individuals who are not exposed to the sun regularly may fear the long-term consequences of weakened bones, making them more susceptible to breaking bones in accidents or falls, leading to a perception of high severity.</p> <p><i>Dietary calcium intake</i> Insufficient calcium intake from dietary sources or supplements is a significant factor in bone health.</p>	<p><i>Natural vitamin D synthesis</i> The most direct benefit of sun exposure in relation to osteoporosis is the natural synthesis of vitamin D. When ultraviolet (UV) rays from the sun hit the skin, they trigger the production of vitamin D, which is vital for calcium absorption in the body. Adequate calcium levels are essential for maintaining strong bones and preventing bone loss, which is key in reducing the risk of osteoporosis.</p> <p><i>Bone health support</i> Vitamin D helps regulate calcium and phosphorus in the blood, both of which are necessary for bone health. Individuals who get adequate sun exposure are more likely to have higher vitamin D levels, which can help maintain bone density and reduce the risk of fractures associated with osteoporosis.</p> <p><i>Prevention of bone density loss</i> Regular sun exposure helps prevent the natural decline in bone mineral density that occurs with aging. This is particularly important for older adults who are more susceptible to osteoporosis and fractures due to age-related bone loss. The perceived benefit is that adequate sunlight exposure can slow or prevent this age-related bone deterioration.</p>	<p><i>Risk of skin cancer</i> A significant barrier to sun exposure is the widespread awareness of the risks of skin damage, particularly skin cancer, due to overexposure to UV rays. People may be reluctant to spend time in the sun because of the potential for developing skin cancer, which is often seen as a serious and long-term health risk.</p> <p><i>Premature aging</i> In addition to the risk of skin cancer, concerns about premature aging (wrinkles, sunspots, and loss of skin elasticity) often discourage people, particularly those in older age groups, from spending time in the sun. These concerns may lead individuals to avoid sun exposure despite its benefits for bone health.</p> <p><i>Balancing sun exposure and skin protection</i> Some individuals may perceive a difficulty in balancing the need for sun exposure to synthesize vitamin D with the need for skin protection, such as wearing sunscreen or protective clothing. This balancing act can deter people from taking the necessary steps to get adequate sunlight for bone health.</p>
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PREGNANCY AND BREASTFEEDING

Perceived susceptibility	Perceived severity	Perceived benefits	Perceived barriers
<p><i>Pregnancy-related sensitivity to sun</i> Pregnant women may perceive themselves as more susceptible to sunburns or skin damage due to hormonal changes that increase skin sensitivity. The risk of melasma (darkening of the skin) is heightened during pregnancy, leading women to avoid direct sunlight at the beach or feel at risk of visible skin changes.</p> <p><i>Heat and overheating</i> Pregnant women may feel more vulnerable to the effects of overheating or heat exhaustion, especially when exposed to the sun for prolonged periods. This can be exacerbated by the risk of dehydration in hot weather, which might lead to complications such as preterm labor or low amniotic fluid.</p> <p><i>Breastfeeding and hydration</i> For breastfeeding mothers, the need to stay hydrated is even more critical, as breastfeeding increases the body's fluid requirements. They may feel particularly susceptible to dehydration, which could impact milk production, energy levels, and overall well-being.</p>	<p><i>Heatstroke and dehydration</i> Pregnant women may perceive overheating as a very serious issue, as it can have severe consequences, such as heatstroke, dizziness, or fainting. Severe dehydration during pregnancy may lead to complications like preterm labor or low amniotic fluid, which can be detrimental to both the mother and the baby. The perceived severity of this risk may prevent pregnant women from staying at the beach for extended periods, especially in high heat or humidity.</p> <p><i>Increased risk of premature labor</i> Pregnant women may fear that prolonged exposure to the sun or high temperatures could trigger early labor or miscarriage, particularly if they are in the later stages of pregnancy. For those who are high-risk pregnancies, even moderate heat exposure may be seen as a major risk factor, heightening their concerns about the severity of the potential outcomes.</p> <p><i>Risk to breastfeeding and milk production</i> For breastfeeding mothers, dehydration is perceived as a serious risk because it can affect milk production. If the mother becomes severely dehydrated, it can impact her ability to nurse properly and provide adequate hydration to her baby. This can lead to stress and concern about the baby not getting enough nourishment.</p>	<p><i>Breastfeeding at the beach</i> Breastfeeding ensures proper hydration and nutrition, even in hot weather. Breast milk provides antibodies, protecting against potential illnesses from environmental exposure at the beach. Breastfeeding on the beach is convenient – no need for formula, bottles, or sterilizing equipment. It offers a chance to relax while providing nourishment and hydration for the baby. Being in nature can improve mood and reduce stress, benefiting maternal mental health during pregnancy and breastfeeding.</p>	<p><i>Physical barriers</i> Difficulty finding shaded or comfortable areas for resting or breastfeeding. Challenges in managing the physical demands of pregnancy on uneven sandy surfaces. Discomfort caused by heat, sweat, or swelling during pregnancy or while breastfeeding.</p> <p><i>Logistical barriers</i> Lack of private or designated breastfeeding areas on crowded beaches. Inconvenience of carrying necessary items (e.g., water, sunscreen, nursing cover) to ensure comfort and safety.</p> <p><i>Emotional barriers</i> Feelings of self-consciousness or embarrassment about breastfeeding in a public and potentially crowded environment. Fear of criticism or lack of support from others on the beach.</p>

WOMEN'S PERSONAL HYGIENE

<p><i>Increased risk of infections</i> Prolonged exposure to wet swimsuits, combined with menstrual flow, can alter the vaginal pH, creating conditions conducive to bacterial or fungal growth.</p> <p><i>UTIs (urinary tract infections)</i> Humid and warm environments can promote bacterial proliferation, particularly when proper hygiene practices (e.g., frequent changing of menstrual products) are not followed.</p> <p><i>Leakage or inadequate menstrual protection</i> Using inappropriate or poorly fitted menstrual products (e.g., tampons or pads) may result in leaks, which can lead to discomfort, embarrassment, and potential skin irritation or infections.</p> <p><i>Dehydration and its impact on menstrual health</i> Dehydration, common in sunny beach environments, can exacerbate menstrual cramps and fatigue, increasing discomfort during the period.</p>	<p><i>Infections and complications</i> If proper hygiene is not maintained, bacterial infections can occur. Left untreated, urinary tract infection may lead to kidney infections, which can have serious, long-term health consequences. Prolonged exposure to wet swimsuits combined with menstrual flow can disrupt the vaginal pH balance, leading to fungal infections.</p>	<p><i>Reduced risk of infections</i> Proper hygiene reduces the likelihood of bacterial infections (e.g., UTIs, vaginosis) and fungal infections like yeast infections. Regularly changing menstrual products like tampons or pads prevents dangerous conditions.</p> <p><i>Maintaining reproductive health</i> Preventing recurring infections protects long-term reproductive health, reducing risks of complications like infertility caused by untreated UTIs or other infections.</p> <p><i>Dry and clean feeling:</i> Changing out of wet swimwear and using appropriate menstrual products help maintain a fresh, dry, and comfortable sensation.</p>	<p><i>Social stigma and embarrassment</i> Cultural or personal discomfort discussing menstruation or handling menstrual hygiene in public settings. Fear of leaks, stains, or odors can cause stress and self-consciousness.</p> <p><i>Lack of facilities</i> Many beaches lack clean, private, or accessible restrooms or changing areas. Women may feel uncomfortable using unsanitary facilities for changing menstrual products or cleaning themselves.</p> <p><i>Uncertainty about best practices:</i> Lack of knowledge about how to maintain hygiene effectively in a beach environment</p>
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PHYSICAL ACTIVITY			
Perceived susceptibility	Perceived severity	Perceived benefits	Perceived barriers
<p><i>Heat-related illnesses</i> Increased risk of dehydration, heat exhaustion, or heatstroke during prolonged physical activity in the sun.</p> <p><i>Sun exposure</i> Higher susceptibility to sunburn or long-term risks like skin damage and skin cancer due to inadequate sun protection.</p> <p><i>Injuries</i> Susceptibility to injuries from beach sports (e.g., sprains, cuts, or bruises from activities like volleyball, running, or swimming).</p>	<p><i>Burns on feet</i> Walking barefoot on scorching sand can cause burns, leading to blistering and discomfort that may require medical treatment.</p> <p><i>Cuts and abrasions</i> Sharp shells, broken glass, or rocks hidden in the sand can cause injuries, increasing the risk of infection. Walking near the waterline exposes individuals to potential stings from jellyfish or bites from crabs, some of which may cause severe allergic reactions. Open cuts or abrasions can become infected by bacteria present in the sand or water, such as <i>Vibrio vulnificus</i>, potentially leading to serious health complications.</p>	<p><i>Cardiovascular health</i> Walking on sand provides a low-impact workout that strengthens the heart and improves circulation.</p> <p><i>Muscle engagement</i> Walking on uneven sand activates and strengthens leg muscles, ankles, and core, enhancing physical fitness.</p> <p><i>Weight management</i> Sand walking burns more calories than walking on flat surfaces, contributing to weight management and overall fitness.</p> <p><i>Low-impact exercise</i> Walking on sand is gentler on the joints compared to harder surfaces, making it a beneficial activity for those with joint pain or arthritis. The soft surface absorbs impact, reducing the strain on knees, hips, and ankles.</p>	<p><i>Overheating and dehydration</i> The summer heat can make walking on the beach uncomfortable, with the potential for dehydration or heat exhaustion if adequate water intake and shade are not available. This may discourage people from walking in peak sunlight hours.</p> <p><i>Increased fatigue</i> Walking on hot sand can be more physically demanding, leading to quicker fatigue, which could make people feel that walking is too tiring or impractical, especially for those who are not used to physical activity.</p> <p><i>Ankle sprains or strains</i> The uneven terrain of the beach can increase the risk of twisting an ankle or experiencing strains from walking on shifting or unstable sand. People with mobility issues or those prone to joint problems may feel concerned about walking in such an environment.</p>
FIRST AID (jellyfish or other venomous marine species or insects)			
<p><i>Prevalence of jellyfish and marine species in summer</i> During summer, jellyfish and other venomous marine species are more commonly found along beaches, especially in warmer coastal waters. This seasonal increase in marine life heightens the perceived susceptibility of beachgoers to encounters and stings. People might be more aware of jellyfish-related incidents during the summer months, increasing the feeling of vulnerability due to the higher probability of an encounter with these creatures. Certain beaches may be more prone to jellyfish swarms or venomous species due to water currents, tides, and other environmental factors. Individuals swimming or walking in shallow waters may perceive themselves as more susceptible, particularly if they know the beach is located in an area known for frequent jellyfish or stingray sightings.</p>	<p><i>Pain and discomfort</i> Jellyfish stings, especially from more venomous species like box jellyfish can cause excruciating pain. The severity of the pain, which can range from mild to intense, is often perceived as a significant risk. People may fear that the sting could last for hours and require medical attention. Stingray stings can cause deep, puncture-like wounds that may be highly painful, and people may worry about the long-lasting pain and swelling that may follow. Bee stings may lead to localized pain, swelling, and discomfort, and the perceived severity increases for those allergic to bee venom, as they could experience severe reactions, including anaphylactic shock</p>	<p><i>Better awareness of marine life and bees</i> People may perceive benefits in becoming more aware of dangerous marine species, such as jellyfish or stingrays, or the risks of bee stings. This awareness can lead to better preparedness, including knowing how to avoid stings or how to react in case of an emergency. By learning to identify dangerous creatures, individuals may feel a greater sense of control over the risks they face at the beach, enhancing their ability to enjoy outdoor activities safely.</p> <p><i>Preventive measures (safety and preparedness)</i> Educating individuals about preventative actions, such as wearing protective footwear, using vinegar to treat jellyfish stings, or carrying an epinephrine auto-injector for bee allergies, could be seen as a benefit. People might feel empowered knowing they can take steps to reduce their likelihood of stings, such as avoiding swimming in areas with jellyfish swarms or wearing protective clothing. This could lead to increased confidence and more frequent visits to the beach.</p>	<p><i>Limited availability of protective gear or resources</i> While some individuals may know that wearing protective clothing (e.g., rash guards or swim shoes) or using specific products (e.g., sting-repellent creams or bee-repellent sprays) can reduce the risk of stings, these items may not always be easily available at beaches or in stores near coastal areas. Lack of access to treatment resources, such as vinegar or first-aid kits, could also limit individuals' ability to effectively respond to a sting. Not all beaches may be equipped with public safety resources like vinegar stations for jellyfish stings or signage about marine life hazards. Many people may avoid wearing protective clothing, such as rash guards or special shoes, because they find them uncomfortable, unattractive, or inconvenient, especially in hot, sunny weather. This reluctance to adopt preventive measures can increase the likelihood of stings and discourage people from fully enjoying their beach experience. Some may feel that wearing protective gear limits their mobility or enjoyment of the beach, making it a barrier to feeling comfortable and confident while engaging in outdoor activities.</p>

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HOW TO AVOID DROWNING: ESSENTIAL WATER SAFETY TIPS

Perceived susceptibility	Perceived severity	Perceived benefits	Perceived barriers
<p>Italy's varied coastline, with its rocky cliffs, shallows, and deep waters, can create unpredictable conditions, making some beaches more prone to hidden currents or waves that can pull swimmers under.</p> <p>Some individuals, particularly those who consider themselves strong swimmers, may feel less susceptible to drowning, which could lead to risky behavior.</p> <p>Overconfidence in their ability to handle challenging water conditions might cause them to swim in dangerous areas, ignore warning signs, or overestimate their capacity to handle exhaustion or rough water conditions.</p> <p>Beachgoers may feel that they are immune to drowning, especially if they have swum in other places without incident. However, this perception may cause them to overlook the unpredictable nature of the sea, especially in unfamiliar locations or when engaging in unfamiliar water activities.</p>	<p><i>Fatal consequences of drowning</i> The most severe consequence of drowning is death. The perception of severity is significantly heightened when people understand that drowning can lead to the loss of life, especially when they hear about tragic accidents or see stories of people who drowned during their vacations or summer outings. This perception is particularly strong when individuals realize that drowning can happen quickly and silently, even in seemingly calm waters, and can be a fatal event.</p> <p><i>Brain damage from drowning</i> In cases where drowning does not result in immediate death, the perceived severity can be increased by the possibility of long-term, debilitating physical consequences. Individuals who are rescued from near-drowning incidents may suffer from hypoxic brain injury (lack of oxygen to the brain), leading to permanent neurological damage. Victims of near-drowning accidents can experience cognitive impairments, memory loss, or motor dysfunction, which could severely impact their quality of life. This awareness makes drowning seem not only a life-threatening event but also a life-altering one for those who survive.</p>	<p><i>Avoiding fatalities</i> The most significant benefit of avoiding drowning is the preservation of life. By taking precautions, individuals can avoid potentially fatal drowning incidents, ensuring that they, their families, and their loved ones remain safe. The perceived benefit is that following safety guidelines – such as swimming in designated areas, staying alert to water conditions, and heeding lifeguard advice – helps reduce the likelihood of life-threatening situations.</p> <p><i>Lower healthcare costs and stress on emergency services</i> By avoiding drowning and water-related accidents, individuals can significantly reduce the financial burden on healthcare systems. Emergency response teams, hospital resources, and long-term medical care for victims of drowning or near-drowning are expensive. Preventing such incidents lowers medical costs and lessens the strain on emergency responders, helping maintain a more efficient healthcare system.</p>	<p><i>Unawareness of risks</i> Many individuals may not fully understand the risks associated with drowning, especially if they are not familiar with water safety measures. People may perceive drowning as something that only happens to others and not recognize that it can occur in seemingly safe waters or under everyday circumstances. This lack of awareness may lead to negligence regarding safety practices like swimming in designated areas or wearing life vests.</p> <p><i>Lack of lifeguards or safety equipment</i> Not all beaches, especially in less commercial or remote areas, are equipped with the proper safety infrastructure. The absence of lifeguards, first-aid stations, or safety signage can create barriers to drowning prevention. Without visible safety measures in place, beachgoers may feel less inclined to follow water safety guidelines or may not even be aware of potential dangers.</p> <p><i>Reluctance to use safety devices</i> Some beachgoers may see safety devices like life vests, flotation devices, or sunscreen as cumbersome or inconvenient. The perceived inconvenience of using these safety tools may deter people from taking necessary precautions.</p>