

Appendix A: Competition Cases

Case 1: Access to Diabetes Care in Texas

Situation: Maria is a 45-year-old woman living in Houston, Texas, diagnosed with Type 2 diabetes. She struggles to afford her medications due to high costs and lack of insurance. Maria faces barriers to accessing healthcare providers, as her neighborhood has few clinics, and the available ones are often overcrowded. Her limited income affects her dietary options, primarily leading her to unhealthy, processed foods. Maria's job as a cashier doesn't provide health benefits, and she often has to choose between paying for her medications or other essential needs. She lives in a food desert, making it challenging to find fresh, nutritious foods. Maria's situation is further complicated by her lack of reliable transportation, making it difficult to reach better-equipped healthcare facilities or grocery stores.

Week 1: Question: How can we improve access to diabetes care for low-income populations in urban areas?

Budget: \$1,000,000

Week 2 - Epidemiology: What epidemiological data would be most useful in identifying high-risk groups for Type 2 diabetes in Houston?

- What existing surveillance systems (e.g., BRFSS, NHANES, local health department registries) could provide data on diabetes prevalence and outcomes in Houston?
- How can social determinants of health (e.g., income, food access, transportation, insurance status) be incorporated into epidemiologic mapping of diabetes risk?
- What role does geographic information system (GIS) mapping play in identifying “hot spots” for diabetes and food deserts in Houston?
- How might disparities in race/ethnicity and immigration status shape diabetes burden and outcomes in Texas?
- What data would help evaluate the long-term consequences of medication non-adherence in uninsured populations?

Week 3 - Research: How could community-based participatory research methods be used to better understand the barriers to diabetes care in Maria's neighborhood?

- What research designs (e.g., cohort studies, RCTs, natural experiments) would be most effective in studying access to diabetes care in underserved urban settings?
- What types of qualitative research (e.g., focus groups, interviews) could best capture lived experiences of managing diabetes in food deserts?
- How can mixed-methods research provide a fuller understanding of the interaction between social determinants of health and diabetes outcomes?

- What ethical considerations arise when conducting research with uninsured or undocumented populations in Houston?

Week 4 - Global Health: How do diabetes management strategies in the U.S. compare to those in countries with universal healthcare systems?

Week 5 - Environmental Health: In what ways might the built environment of Maria's neighborhood be contributing to higher rates of diabetes?

Week 8 - Twist: Recently, a major hurricane has been forecast for the area, threatening to cause power outages and flooding that could disrupt her access to medications and healthcare facilities.

Case 2: Air Quality Impact on Asthma in California

Situation: James is a 12-year-old boy living in Los Angeles, struggling with asthma exacerbated by poor air quality in his neighborhood. Industrial sites near his home produce significant pollution, affecting his respiratory health. Despite the challenges, his family cannot afford to move to a healthier environment due to high housing costs. James frequently misses school due to asthma attacks, impacting his education and social development. His parents work long hours and struggle to take time off for his medical appointments. The family's apartment is old and poorly ventilated, trapping pollutants inside. James's school is located near a busy highway, further exposing him to air pollution during the day. The family's limited English proficiency makes it challenging to navigate the healthcare system and advocate for better environmental policies.

Week 1 Question: What interventions can help reduce asthma attacks in children living near industrial pollution?

Budget: \$1,500,000

Week 2 - Epidemiology: How could a time-series analysis be used to examine the relationship between daily air pollution levels and asthma-related emergency room visits in Los Angeles?

- What kinds of health data (like ER visits, school absences, or inhaler use) would help show the impact of air pollution on kids with asthma?
- What role do social factors (like income, housing, or language barriers) play in which kids are most affected by asthma?
- How might comparing asthma rates before and after a major pollution event (like wildfires or smog alerts) help us understand the impact of air quality?
- What challenges might exist in collecting accurate data about asthma and pollution in communities like James's?

Week 3 - Research: What research design would you propose to study the correlation between air quality improvements and asthma outcomes in James's community?

- How could researchers track children's health (like fewer asthma attacks or hospital visits) to see if cleaner air makes a difference?
- Why might surveys of families and schools be important in understanding asthma triggers and barriers to care?
- What role could schools play in helping collect data about asthma (like attendance, nurse visits, or inhaler use)?
- How might involving community members (like James's parents) make the research stronger and more accurate?

Week 4 - Global Health: How do California's air quality standards and regulations compare to those of other countries with similar industrial development?

Week 5 - Environmental Health: What environmental health indicators would be most relevant in assessing the impact of industrial emissions on respiratory health in James's neighborhood?

Week 8 - Twist: An aggressive new COVID-19 strain emerges in Los Angeles, causing severe complications in asthma patients. James's neighborhood becomes a hotspot, overwhelming local hospitals.

Case 3: Mental Health Access in Alaska Native Communities

Situation: Sarah is a 17-year-old Alaska Native girl living in a remote village in the Aleutian Islands. Her community faces significant challenges in accessing mental health services, with the nearest psychiatrist located hundreds of miles away in Anchorage. Sarah has been struggling with depression and anxiety, exacerbated by the isolation and harsh climate of her region. The village has limited internet connectivity, making telehealth services unreliable. Cultural stigma surrounding mental health issues often prevents community members from seeking help. Sarah's school lacks a full-time counselor, leaving students without consistent support. The village's economy relies heavily on seasonal fishing, leading to financial instability for many families, including Sarah's. Substance abuse is prevalent in the community, often used as a coping mechanism for untreated mental health issues. Traditional healing practices are important to the community but are not always integrated with modern mental health approaches. The long, dark winters in Alaska contribute to high rates of seasonal affective disorder among residents.

Question: How can we improve mental health support and access to care in remote Alaska Native communities?

Budget: \$1,200,000

Week 2 - Epidemiology: What epidemiological approaches would be most appropriate for studying the prevalence and risk factors of mental health issues in Alaska Native populations?

Week 3 - Research: How could culturally responsive research methods be employed to study mental health needs and treatment preferences in Sarah's community?

Week 4 - Global Health: How do mental health support strategies for indigenous populations in Alaska compare to those used for indigenous groups in other countries?

Week 5 - Environmental Health: How might environmental factors unique to Alaska (e.g., extreme daylight variations, isolation) be influencing mental health outcomes in Sarah's community?

Week 8 - Twist: A powerful earthquake strikes the region, damaging critical infrastructure and further isolating the community, creating an urgent need for crisis intervention and mental health support in the aftermath of the disaster.

Case 4: Malaria Prevention in Nigeria

Situation: Aisha is a 30-year-old woman living in a rural village in Nigeria, facing challenges in accessing healthcare and malaria prevention tools. Despite the high prevalence of malaria in her region, she lacks access to mosquito nets and proper healthcare facilities. Aisha works as a subsistence farmer, and her income fluctuates with crop yields. The nearest health clinic is 20 kilometers away, making it difficult to seek timely treatment. Many in her community, including Aisha, have limited education about malaria prevention and treatment. The village lacks proper sanitation and waste management, creating breeding grounds for mosquitoes. During the rainy season, the unpaved roads to the health clinic become impassable, further limiting access to care. Traditional beliefs sometimes conflict with modern medical advice, complicating health education efforts.

Question: What community-based strategies can be implemented to reduce malaria transmission?

Budget: \$2,000,000

Week 2 - Epidemiology: What epidemiological methods would be most effective in tracking the incidence and spread of malaria in Aisha's region?

Week 3 - Research: How could implementation science be applied to improve the adoption of malaria prevention strategies in Aisha's village?

Week 4 - Global Health: How do Nigeria's malaria prevention efforts align with global strategies recommended by the World Health Organization?

Week 5 - Environmental Health: How might climate change be affecting mosquito populations and malaria transmission patterns in Aisha's region?

Week 8 - Twist: An unexpected surge in cases is reported due to a recent influx of displaced persons from a nearby conflict zone, increasing the local disease burden.

Case 5: Vaccination Gaps in Rural India

Situation: Raj is a 5-year-old boy living in a remote village in India where vaccination coverage is low due to misinformation and distance to health facilities. His parents are hesitant to vaccinate him due to fears surrounding vaccine side effects, exacerbated by a lack of clear information. The village has limited access to electricity and internet, making it difficult to access reliable health information. Cultural beliefs and traditional healing practices sometimes conflict with modern medical interventions. The nearest health center offering vaccinations is 30 kilometers away, and transportation is infrequent and expensive. Many families in the village, including Raj's, live below the poverty line and prioritize daily survival over preventive healthcare. The local school has high dropout rates, limiting opportunities for health education. Gender disparities in the community often result in girls receiving less medical attention than boys.

Question: How can public health campaigns effectively address vaccine hesitancy in rural areas?

Budget: \$1,500,000

Week 2 - Epidemiology: How could surveillance systems be improved to better track vaccination rates and outbreak potential in rural Indian communities?

Week 3 - Research: What research methods could be used to effectively study the reasons for vaccine hesitancy in Raj's community?

Week 4 - Global Health: How do India's vaccination policies and implementation strategies compare to those of other low- and middle-income countries?

Week 5 - Environmental Health: In what ways might environmental factors (e.g., temperature, transportation infrastructure) be affecting vaccine storage and distribution in Raj's area?

Week 8 - Twist: A recent measles outbreak in a neighboring area highlights the urgent need for vaccination, putting Raj's community at greater risk.

