Code Cracking
Global Cancer Disparities: Teacher Answer Key

(Answers taken from WHO/Key Statistics and American Institute of Cancer)

Go to the World Health Organization (WHO) Key Facts page:
https://www.who.int/cancer/resources/keyfacts/en/.
Then, review the statistics and answer the following questions.

1. Cancer rates are highest in high resource countries; why do you think that is?

   This can be largely attributed to behavioral risk factors such as tobacco use, alcohol use, unhealthy diet, and physical inactivity—activities that are more common in high resource countries.

2. Low resource countries have comparatively low rates of cancer, but the rates are on the rise and expected to continue to increase dramatically in the coming years. How would you explain this?

   Lifestyle risk factors such as tobacco use, alcohol use, unhealthy diet changes, and physical inactivity are on the rise in low resource countries. Low resource countries will also continue to see challenges in access to vaccinations.

   Globally, people are living longer and exposure to risk factors is growing. Low- and middle-income countries will face the highest increase in cancer rates unless the exposure to risk factors is reduced. Also, more younger people in the prime of their life are expected to be diagnosed with cancer.

3. Why are most cancer deaths considered preventable?

   About 30% of cancers overall could be avoided with lifestyle changes and healthier behaviors, but the majority of cancer deaths are linked to tobacco: every year 1.5 million people die from cancer linked to tobacco.

4. Looking at the factors that contribute to "preventable" cancers, what types of actions and interventions do you think would have the most impact on cancer rates worldwide?

   Widespread education about risk factors and access to vaccinations could have an enormous impact.

- There are safe and effective vaccines against the human papilloma virus (HPV) that causes cervical cancer and against the hepatitis B virus (HBV) that causes liver cancer.
- Cervical cancer is the second most common cancer in women worldwide. Cost-effective and accessible screening programs to detect cervical cancer or pre-cancer combined with prompt treatment can reduce deaths in women.
- Liver cancer killed more than 700,000 people in 2008. Most cases of liver cancer (78%) are caused by the hepatitis B virus (HBV) and the hepatitis C virus (HCV). The HBV vaccine can prevent most of the new HBV infections.

Go to the American Institute of Cancer Research cancer rate comparison site: https://www.wcrf.org/dietandcancer/cancer-trends/comparing-more-and-less-developed-countries . Then, answer the following questions.

This organization uses the Human Development Index (HDI) instead of income levels to rank a country's development level. The United Nations defines the HDI as "a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable, and have a decent standard of living." You can read more about what statistics (i.e., life expectancy, years of schooling, gross national income, etc.) are used for each of the three dimensions in the HID here: http://hdr.undp.org/en/content/human-development-index-hdi.

5. What three key factors do they consider in assigning this ranking?

   According to this website: "The Human Development Index (HDI) measures average achievement in three key dimensions of human development: a long and healthy life, knowledge and a decent standard of living."

6. Are these three indexes objective or subjective?

   This question is designed to encourage students to take an analytical look at the HDI definition used by this site. Students might note that factors like life span can be measured and quantified and are objective measurements, but a "decent" standard of living could be a subjective measure. Students might be encouraged to research how other global organizations define HDI and if there are ways of quantifying a "decent standard of living".

7. The cancer rate chart has been "age standardized." Why do you think this is important?

   Cancer rates are strongly correlated with age. The longer a person lives the more likely they are to acquire and accumulate mutations that can lead to cancer. If rates aren't standardized one might assume that the higher cancer rates in high resource countries with a longer life expectancy could be explained by an older population. By comparing age standardized rates, however, we know that this isn't true and that there are other factors contributing to the higher cancer rates.

8. Do all the cancer rate comparisons follow the same trend? What is the exception? Why do you think this is?

   Almost all cancer rates are higher in HDI countries with the biggest exception being cervical cancer. Students might remember two key facts from the WHO statistics to create an explanatory hypothesis:

   - There are effective vaccines against the human papilloma virus (HPV) that causes cervical cancer.
   - Cervical cancer is the second most common cancer in women worldwide. Cost-effective and accessible screening programs to detect cervical cancer or pre-cancer combined with prompt treatment can reduce deaths in women.

   Esophogeal cancer is also very slightly higher in low HDI countries.

9. Click on and explore the Interactive Cancer Risk Matrix. Do the risk factor rankings support your conclusions for Questions 1-4?

   The Risk Cancer Matrix graphically illustrates the impact of behavioral risk factors on cancer rates and should support the student's findings.