The Correlation Between Obesity, Poverty, and Esophageal Cancer

Introduction

What is Esophageal cancer?

The esophagus is the hollow tube that moves food and liquid from the throat to the stomach and is made of several layers of tissue. Esophageal cancer is a disease in which malignant cells form in the tissues of the esophagus. It starts in the innermost lining of the esophagus and spreads outwards as it grows. There are two main forms of esophageal cancer that become cancerous. The first one is squamous cell carcinoma that forms in the thin, flat cells that line the esophagus. It is usually in the upper and middle part of the esophagus. The second is Adenocarcinoma which begins in the glandular cells which are responsible for producing fluids like mucus and are present near the bottom of the esophagus near the stomach.

Symptoms

The most common symptoms of esophageal cancer include painful or difficult swallowing, weight loss, pain behind the breastbone, hoarseness and cough, indigestion and heartburn and a lump under in the skin. These signs could also be caused by other conditions, so it's important to consult a doctor before coming to any conclusions.

Disease Progression

After esophageal cancer is detected, tests are also done to check if the cancer has spread to other areas. There are many kinds of tests that can be done for this such as an endoscopic ultrasound, CT/PET scan, MRI, thoracoscopy, laparoscopy and an ultrasound exam. Both squamous cell carcinoma and adenocarcinoma have five stages that the cancer can be categorized into: Stage 0 High-grade Dysplasia, Stage I squamous cell carcinoma/adenocarcinoma of the esophagus, Stage II squamous cell carcinoma/adenocarcinoma of the esophagus, Stage III squamous cell carcinoma/adenocarcinoma of the esophagus and Stage IV squamous cell carcinoma/adenocarcinoma of the esophagus.

Treatment

There are many types of treatments that patients can undergo for esophageal cancer. Here are some examples of treatments done to treat esophageal cancer:

Surgery: the most common treatment in which a part of the esophagus is removed.

Radiation therapy: a treatment that uses high energy X-rays or other types of radiation to kill the cancer cells and keep them from replicating.

Chemotherapy: a treatment that uses drugs that can be taken orally or injected directly into the vein.

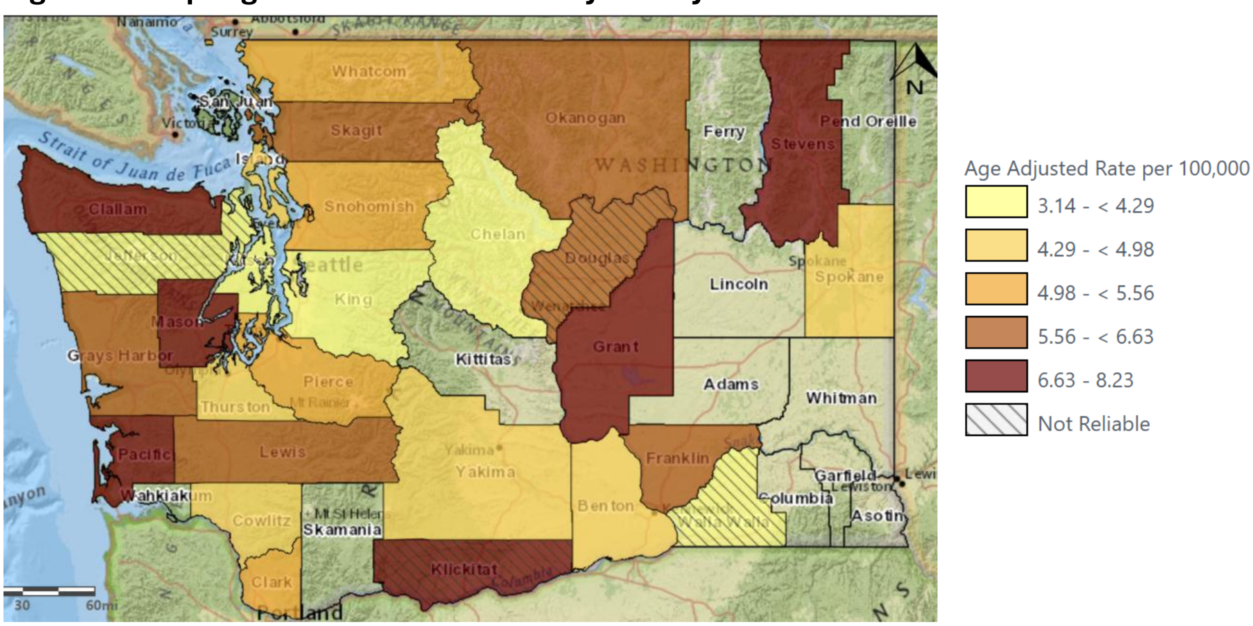
During and post-treatment special care needs to be taken of the patient's nutritional needs because esophageal cancer can make it hard for them to swallow. Therefore, some patients receive nutrients directly into a vein or they need to have a feeding tube running from their nose/mouth to the stomach.

Risk Factors

The risk factors for esophageal cancer are spread under different categories like lifestyle choices, medical history, and genetics. Age is a significant factor since most cases occur in people over 60. Heavy alcohol consumption and all tobacco use significantly increases risk. There are also medical conditions that can increase the risk of getting esophageal cancer like gastroesophageal reflux disease (GERD), obesity is another factor, because of its association with GERD. Dietary habits also play a role; a diet that is low in fruits and vegetables and high in processes meats also increases risk. Lastly, prior injuries to the esophagus, a history of other cancers and HPV can contribute to esophageal cancer.

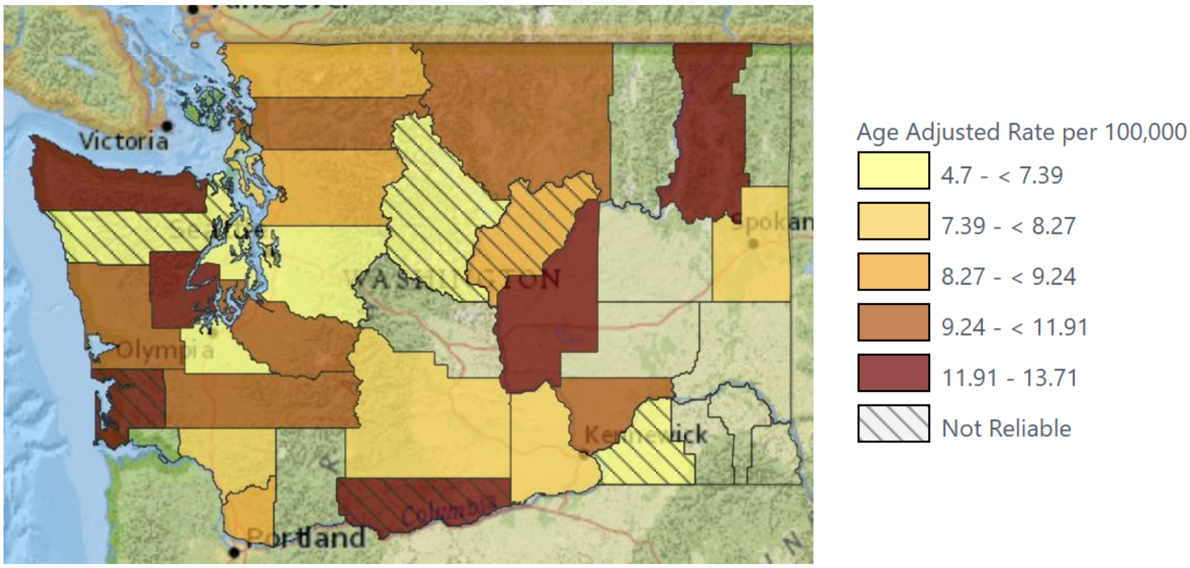
Statistics

Figure 1. Esophageal cancer incidence by county



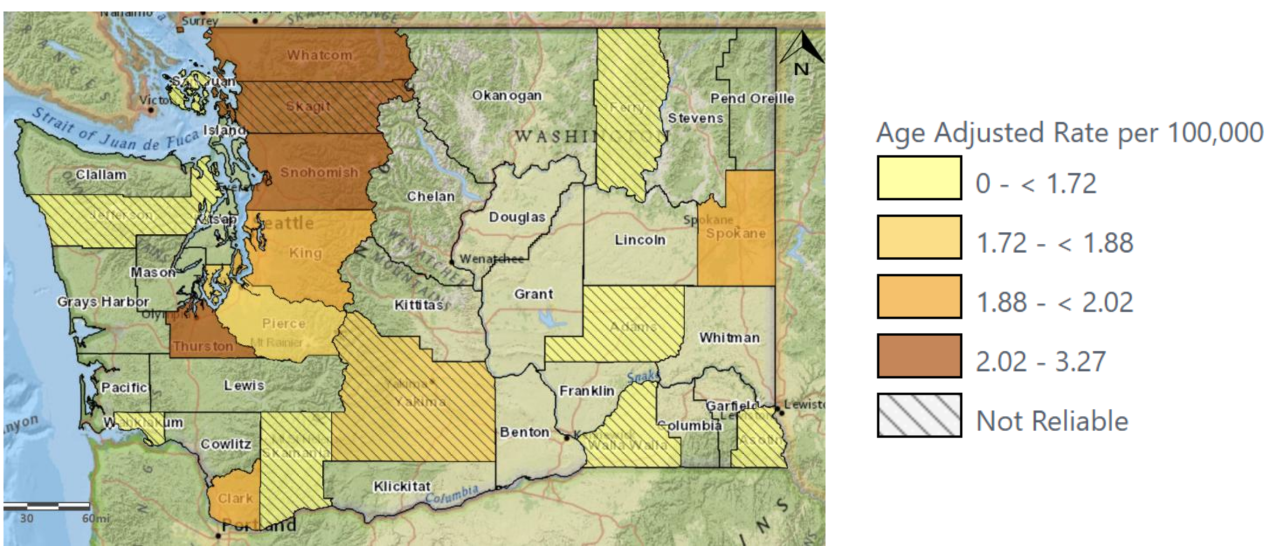
This map shows how often people are diagnosed with esophageal cancer in each county. Darker areas mean more cases per 100,000 people. The differences between counties might be caused by things like health habits, the environment, or how easy it is for people to get medical care. It could also mean that some areas are better at finding and reporting cancer cases than others.

Figure 2. Male Esophageal cancer incidence by county



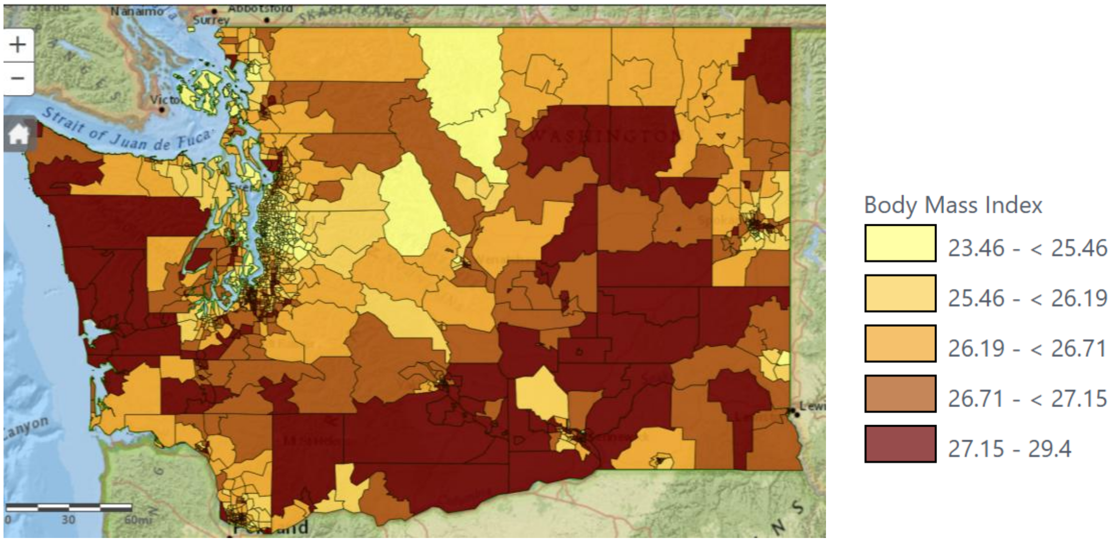
This map shows the esophageal cancer incidence rates in males by county. Many counties have higher rates, suggesting that men are more commonly diagnosed with this type of cancer. This may be due to both biological risk factors and lifestyle habits.

Figure 3. Female Esophageal cancer incidence by county



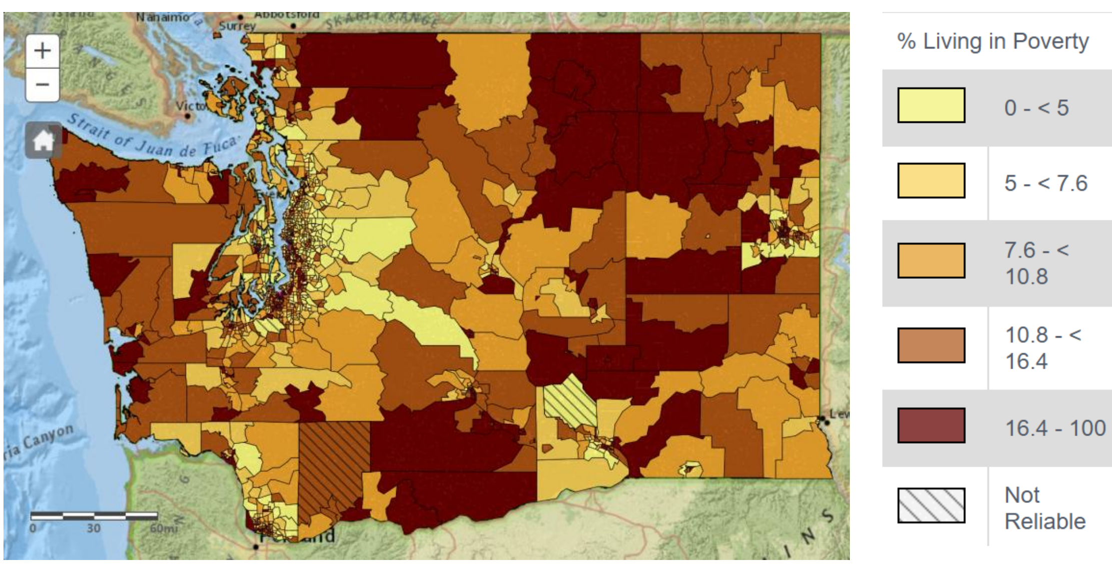
This map shows the esophageal cancer rates for females by county. The rates are generally lower than those compared with males(Figure 2) but this could also be due to when the cancer is diagnosed in women, which could lead to delayed diagnosis.

Figure 4. BMI per county



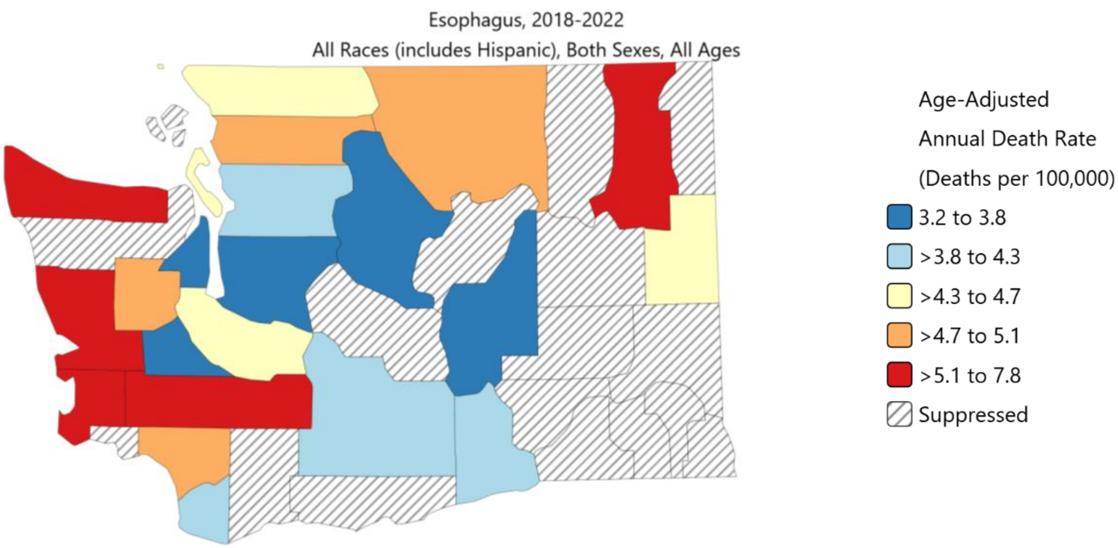
This map shows the average BMI across different counties, with darker shades indicating regions with higher BMI averages. Elevated BMI is a significant risk factor for several chronic conditions, including esophageal adenocarcinoma. This map helps identify areas where obesity may be more prevalent, possibly due to poor access to healthy foods, lack of physical activity resources, or socioeconomic challenges. This information can help create health programs that focus on lowering obesity and preventing cancer.

Figure 5. Percentage of people living in poverty



This map shows the percentage of people living in poverty. Darker areas have a higher percentage of people living in poverty. Money can affect health because it influences things like access to healthy food, doctor visits, and safe places to live or exercise. Counties with lower income and higher percentage of people living in poverty may face more challenges that can lead to health problems, including cancer.

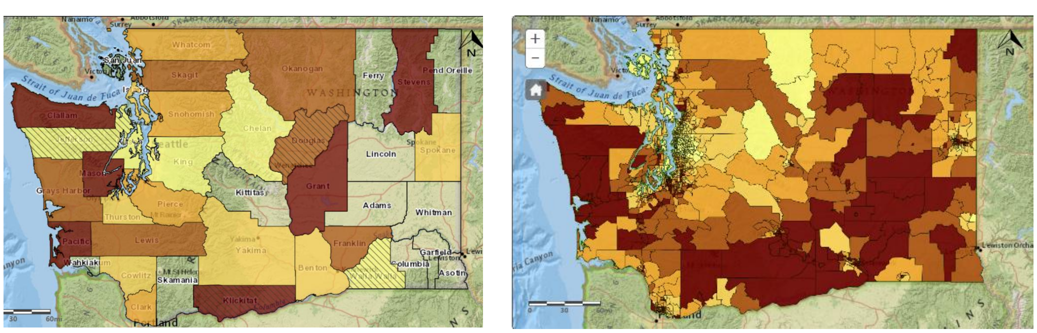
Figure 6. Esophagus Cancer Death Rates for Washington by County



This map shows death rates with esophageal cancer in each county. Darker areas mean more deaths per 100,000 people. The death rates correlates with higher incidence rates and higher BMI and percentage of people living in poverty. The differences between counties might be caused by things like health habits, the environment, or how easy it is for people to get medical care. It could also mean that some areas are better at finding and reporting cancer deaths than others.

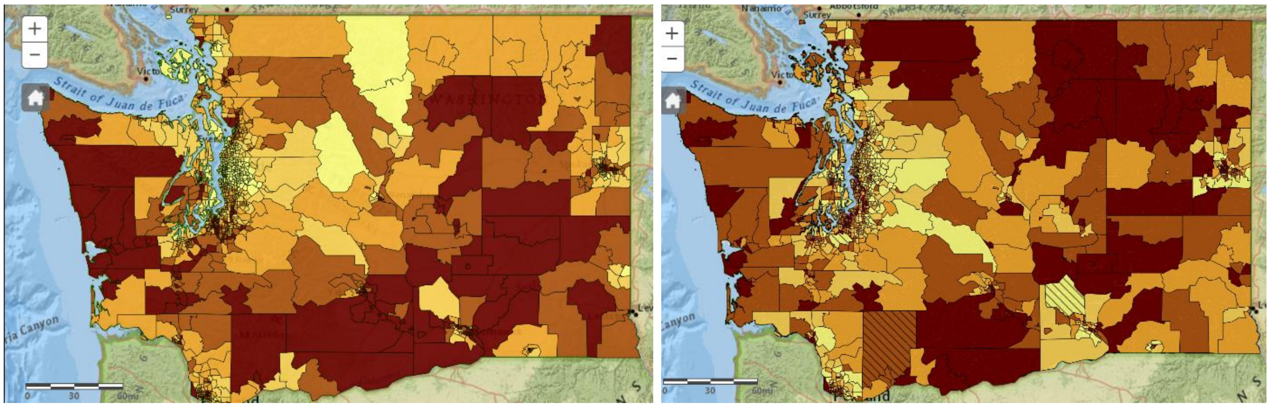
Analysis

Figure 7. Comparison of BMI and Esophageal cancer



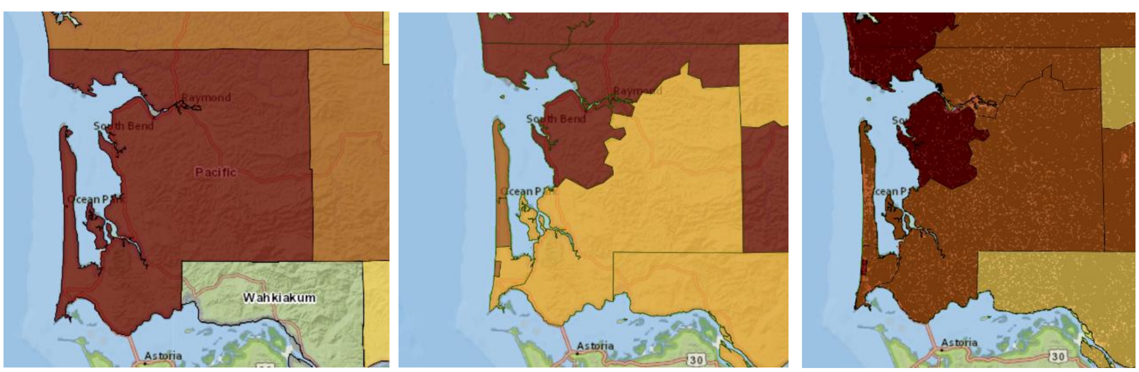
On the left, you can see the Esophageal Cancer Incidence by county. On the right, you can see the BMI per county. These two maps are shown side by side to help compare average BMI and esophageal cancer rates in each county. By looking at them together, we can see that many counties with higher BMI also have more cases of esophageal cancer. This pattern suggests there might be a connection between obesity and the risk of getting this type of cancer. The comparison helps us understand where health education, nutrition programs, and cancer prevention efforts might be needed the most.

Figure 8. Comparison of BMI range and percentage living in poverty



On the left, you can see the BMI per county. On the right side, you can see the percentage of people living in poverty. This map compares income and BMI to see how money might affect body weight. In many areas, lower income is linked to higher BMI. This can happen because healthy food and fitness opportunities might be harder to afford or access. This pattern shows that helping people in lower-income areas live healthier lives could also lower their risk for diseases like esophageal cancer.

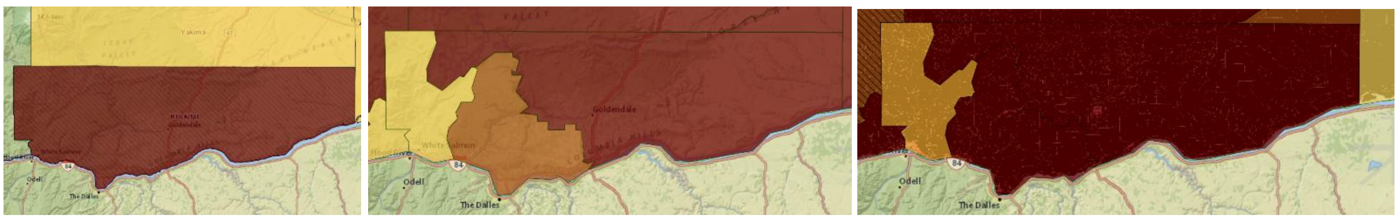
Figure 9. Pacific County Analysis



Esophagus Cancer Level BMI Level % of people living in poverty

Figure 9 shows a comparison of esophageal cancer rates, BMI levels, and poverty in Pacific County. The maps show that the county has a high esophageal cancer rate of 8.23, which matches with higher BMI levels across the area, averaging around 27. This suggests there may be a connection between obesity and the risk of esophageal cancer. Although the overall poverty rate in the county is 7.7%, some areas, especially along the coast, face more economic challenges. These areas also tend to have higher BMI levels, which supports the link between income, health, and cancer risk.

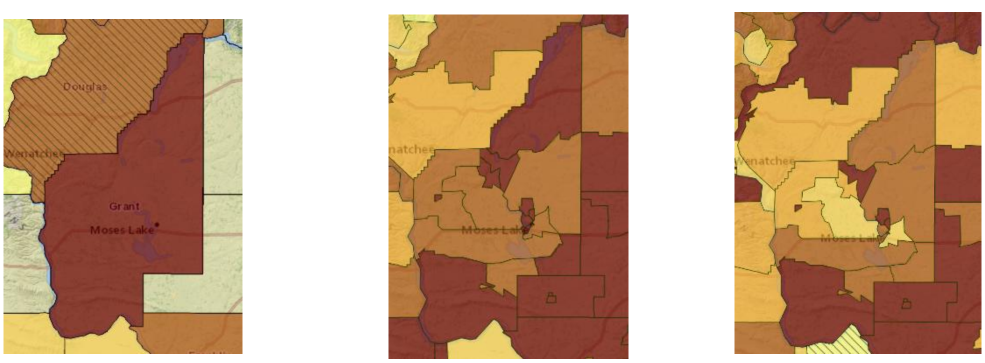
Figure 10. Klickitat County Analysis



Esophagus Cancer Level　　　　BMI Level　　　　% of people living in poverty

Figure 10 shows a comparison of esophageal cancer rates, BMI levels, and poverty in Klickitat County. The maps show that the county has a high esophageal cancer rate of 7.36, which lines up with an average BMI of around 27 across the area. This suggests there may be a connection between obesity and the risk of esophageal cancer. Klickitat County also has a slightly higher poverty rate at 8.6%, and areas with more poverty tend to show higher BMI and cancer rates. This highlights a clear correlation between income, obesity, and esophageal cancer risk in the community.

Figure 11. Grant County Analysis



Esophagus Cancer Level　　　　BMI Level　　　　% of people living in poverty

Figure 11 shows a comparison of esophageal cancer rates, BMI levels, and poverty in Grant County. The maps show that the county has a high esophageal cancer rate of 7.54, which lines up with an average BMI of around 27.4 across the area. This suggests there may be a connection between obesity and the risk of esophageal cancer. Grant County also has a slightly higher poverty rate at 11%, and areas with more poverty tend to show higher BMI and cancer rates. This highlights a clear correlation between income, obesity, and esophageal cancer risk in the community.

Recommendations

To reduce the spread of esophageal cancer and improve public health outcomes across Washington, the focus needs to be shifted to low-income and high-risk communities through public health initiatives. Firstly, it is important to improve access to affordable nutritious food. This can be through investing in programs that make it affordable, healthy options in food deserts through mobile farmer markets and incentive for grocery stores that have nutritious food to operate in underserved areas. Alongside nutrition, community-based obesity prevention programs should also be developed to promote more physical activity and healthier lifestyles. Health education campaigns that teach cooking skills and focus on helping people make a balanced diet will help them make more informed decisions about their health that reduce obesity and with it the risk of many long-term heath diseases. Early detection of cancer is important for making sure that treatment is given before the esophageal cancer reaches its advanced stages. Free or low-cost screening and tests for high-risk individuals, those with a high BMI and GERD should be expanded. Lastly, healthcare equity also needs to be prioritized. Healthcare providers should be trained in implicit bias and make sure that every patient receives equal care and treatment. For this to fully work, reforms will be necessary to ensure that racial and economic gaps are closed as much as possible. Another way would be to integrate health education into schools so that long term health outcomes can be improved by teaching people about nutrition, disease prevention and risks associated with obesity and esophageal cancer from a young age. By implementing these recommendations, Washington can work towards a future where fewer people suffer from preventable diseases like esophageal cancer.

Social Significance

The link between esophageal cancer, obesity, and poverty in Washington State shows a serious public health problem that affects many communities. Counties with high rates of esophageal cancer often also have a large percentage of people living in poverty. In some areas, poverty rates reach 18%, which is much higher than the state average. These same counties often show higher BMI levels, which increases the risk for esophageal cancer, especially the adenocarcinoma type.

People living in poverty face many challenges that make it harder to stay healthy. Nutritious food is often too expensive or hard to find, especially in areas without nearby grocery stores or farmers markets. Regular doctor visits and early cancer screenings may also be not accessible. This makes it more likely that serious health problems, like esophageal cancer, go undetected until it's too late. The five-year survival rate for this cancer is only 20.6%, and late diagnosis is one major reason why.

When a large part of a community is affected by poverty and poor health, the entire area feels the impact. Local hospitals may become overwhelmed, fewer people can work, and students may struggle in school because of long-term health issues. These challenges make it harder for families and communities to grow and succeed. This shows that esophageal cancer is not just a medical problem but it’s also a social issue that needs to be addressed.

Impact

Addressing the connection between obesity and esophageal cancer in low-income communities could help improve public health outcomes across Washington. By lowering BMI levels through better access to nutritious food and expanding early cancer screening programs, we can reduce esophageal cancer rates and improve quality of life, particularly in areas where these resources are limited. Research from the American Institute for Cancer Research shows that healthy eating habits can reduce cancer risk by up to 30%. For example, increasing dietary fiber, which is not in processed foods, can lower the risk of esophageal adenocarcinoma. Also, preventing obesity and related cancers can reduce pressure on healthcare systems and lower costs for Medicaid and Medicare. Obesity-related health issues alone cost Washington State an estimated $1.4 billion per year. Investing in prevention not only protects individual health but it also strengthens the economy and reduces long-term medical expenses.

Equity

The correlation between esophageal cancer and obesity is different in each county. Data shows that counties with higher percentage of people living in poverty such as Klickitat, Grant and Pacific, often have both higher BMI levels and more cases of esophageal cancer. This suggests that income, access to healthy foods, and how close people live to healthcare services all play an important role in health outcomes. In Washington, nearly 1 in 8 people live in poverty, and many of the areas most affected are rural or home to large minority populations, where healthy food and healthcare can be hard to access. Racial and ethnic minorities are more likely to live in these areas. For example, Black and Hispanic communities in Washington have higher rates of obesity-related illnesses and often face more problems in getting preventive care. Studies show that even when people from these groups report the same symptoms, they are less likely to be referred to cancer screenings. This shows that racism and inequality in the healthcare system can impact who gets diagnosed, who gets treated, and who survives.

This makes esophageal cancer not just a health issue, but an equity issue. The resources needed to prevent it such as healthy food, early screenings, and health education are more available to higher-income families, while many low-income families are left without them. Until this gap is closed, these communities will continue to experience higher rates of disease and worse outcomes.

Also, esophageal cancer being more common in males than females also brings up important equity questions. While biological differences may play a role, the lack of data could also reflect the gaps that are caused by access to care and how seriously the symptoms are taken for each gender. Women may be diagnosed later because of gender bias in healthcare or because their symptoms are reported or understood differently. To fix this, we need better education, equal access to screening, and healthcare providers to recognize the symptoms equally in both genders.

Conclusion

The relationship between socioeconomic status and health outcomes is deeply rooted, and esophageal cancer is another example of how poverty and set off a chain reaction that leads to poorer health. Low-income households across Washington are disproportionately affected by high BMIs and in turn higher incidence rates of esophageal cancer.

Living in a low-income household significantly increase the chances of obesity due to the lack of access to affordable nutritious food and safe environments for physical activity. Many of these families rely on processes, calorie rich, nutrient deficient foods because they simply cannot afford healthier alternatives, especially in rural areas and food deserts. This pattern, combined with few opportunities for exercise and insufficient health education results in higher BMI in these communities.

A high BMI in turn is one of the main risk factors for esophageal cancer because it increase the risk for GERD, a condition that damages the lining of the esophagus and lead to pre-cancerous conditions. Individuals in poverty are also less likely to get frequent check-ups, cancer screenings and early intervention for GERD and as a result the cancer goes undiagnosed until it reaches a more advanced stage.

The data presented above such as county level levels of BMI, poverty, and esophageal cancer incidence rates show how these factors intersect. Counties with the lowest household incomes also show higher BMI levels and esophageal cancer rates. Addressing esophageal cancer cannot only be a clinical issue but it needs to be considered a social and economic one as well. Public health strategies should go past just treatment and focus on the root causes that increase the prevalence of this disease: poverty, food insecurity and unequal access to care. This could mean investing in healthier food options, supporting community-based nutritional and exercise programs and better health literacy.

Reflection

When we first started the project, we were not very familiar with esophageal cancer, but as we research more, we realized how serious and complex it is. It is not a very well-known cancer, but it has some serious problems, and the risk of cancer can be reduced through prevention strategies. We were also very surprised by how much it connects to other public health issues like obesity and poverty. We chose this cancer because of the high death rate associated with it and once we saw how things like BMI, income and access to care affects this, we want to highlight and showcase the importance to the public. A big part of our process involved looking at different maps and data and analyzing them to find correlation. It was very shocking to see how health outcomes can depend so much on where someone lives and what resources they have. We learned that health is not just biological factors, but it's about equity too. This project helped us see how important it is for public health policies and treatments to focus not only on treatment but also prevention and ensure everyone has access to these resources.

In our project, we only used AI to help brainstorm ideas for the recommendations. We built on those suggestions by adding our own thoughts, research, and analysis.

Sources:

Esophageal Cancer Risk Factors | Esophagus Cancer Risk. https://www.cancer.org/cancer/types/esophagus-cancer/causes-risks-prevention/risk-factors.html. Accessed 15 Apr. 2025.

Esophageal Cancer Treatment - NCI. 6 Dec. 2024, https://www.cancer.gov/types/esophageal/patient/esophageal-treatment-pdq.

Network--4300, EPH-WTN--Washington Tracking. *Data Portal | Washington State Department of Health*. https://doh.wa.gov/data-and-statistical-reports/washington-tracking-network-wtn/data-portal. Accessed 15 Apr. 2025.

State Cancer Profiles. https://statecancerprofiles.cancer.gov/index.html. Accessed 15 Apr. 2025.

https://hdpulse.nimhd.nih.gov/data-portal/social/table?age=001&age_options=ageall_1&demo=00007&demo_options=poverty_3&race=00&race_options=race_7&sex=0&sex_options=sexboth_1&socialtopic=080&socialtopic_options=social_6&statefips=53&statefips_options=area_states. Accessed 15 Apr. 2025.