

Master of Public Health
Integrative Learning Experience Report

*Disease investigation on Hepatitis B and C, and
Tuberculosis Awareness*

by

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Submitted in partial fulfillment of the requirements for the degree

MASTER OF PUBLIC HEALTH

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Summary

Hepatitis is a liver inflammation caused by hepatitis viruses, autoimmune diseases, and drugs, among other factors. In the United States, the incidence rate of chronic hepatitis C in 2021 was reported to be 56.7 cases per 100,000 people, while the acute hepatitis C incidence rate was 1.3 cases per 100,000 population. Chronic hepatitis B virus incidence in 2021 was 5.9 per 100,000 people, while acute hepatitis B virus was 1.0 per 100,000 population (CDC, 2021). The World Health Organization stated that the hepatitis B virus and hepatitis C virus are responsible for 1.1 million deaths worldwide in 2019 (Philippa et al., 2021). Hepatitis causes liver damage, cirrhosis, and liver cancer, contributing to nearly one-fourth of all patient deaths (CDC, 2021).

Tuberculosis is an infectious disease that most often affects the lungs and is caused by *Mycobacterium tuberculosis*. Latent tuberculosis infection is an infection with *Mycobacterium tuberculosis* in which the bacteria are alive but contained by the immune system. However, it is not infectious when compared to active tuberculosis. The estimated prevalence of latent tuberculosis infection in the United States is 5.0% (13 million individuals) (Mangione et al., 2023).

EpiTrax was a significant tool for investigating communicable diseases, environmental hazards, and bioterrorism threats. In this report, data of probable and confirmed hepatitis C cases in Wyandotte County, Kansas, were obtained and analyzed from the EpiTrax tool and then graphically represented. In this report, data of probable and confirmed hepatitis C cases in Wyandotte County, Kansas, were obtained and analyzed from the EpiTrax tool, and then, graphically represented, showing the total number of cases, ethnicity, race, age, gender, case status, and outcomes. In addition, interventions performed for patients with unfavorable outcomes were indicated. Also, I consulted the Data informaticist, the Public information officer, the tuberculosis case manager, the perinatal hepatitis B prevention program coordinator, and the chief epidemiologist for meaningful information.

The purpose of the project was to create awareness of these diseases for the residents of Wyandotte County. In attaining my objectives, I observed several determinant factors influencing the transmission of diseases among the residents through community outreach and clinical meetings. Flyers and posters were the tools for primary interventions used to create awareness within the county.

Subject Keywords: Hepatitis, Tuberculosis, EpiTrax, Disease investigation, Awareness, Wyandotte County.

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Abbreviations

| | |
|--|-------|
| Alanine transaminase | ALT |
| Aspartate transaminase | AST |
| Centers for Disease Control and Prevention | CDC |
| Direct-Acting Antivirals | DAAs |
| Deoxyribonucleic Acid | DNA |
| Food and Drug Administration | FDA |
| Hepatitis B Virus | HBV |
| Hepatitis B e Antigen | HBeAg |
| Hepatitis B Surface Antigen | HBsAg |
| Hepatitis C Virus | HCV |
| Human Immunodeficiency Virus | HIV |
| Immunoglobulin G | IgG |
| Interferons | IFN |
| Interferon-Gamma Release Assays | IGRA |
| Intravenous Drug Use | IVDU |
| Latent Tuberculosis Infection | LTBI |
| Maternal-Child Transmission | MTCT |
| Mycobacteria Tuberculosis | MTB |
| Nucleoside Polymerase Inhibitors | NPIs |
| Perinatal Hepatitis B Prevention Program | PHBPP |
| Post Exposure Prophylaxis | PEP |

| | |
|------------------------------------|-------|
| People Living with Injection Drugs | PWID |
| Post-Exposure Prophylactic | PEP |
| Post-Vaccination Serologic Test | PVST |
| Reproductive Effective Number | R_E |
| Ribonucleic Acid | RNA |
| Sexually Transmitted Disease | STI |
| Tuberculosis | TB |
| Tuberculin Skin Test | TST |
| Ultraviolet | UV |
| World Health Organization | WHO |

Chapter-1 Literature Review

Hepatitis is an inflammation of the liver tissue caused by heavy alcohol use, toxins, medications (acetaminophen), and certain medical conditions. However, an infection from viral hepatitis A, B, C, D, and E can cause hepatitis. The most common hepatitis viruses in the United States are hepatitis A, B, and C (Verma et al., 2022). In addition, hepatitis A is transmitted through contaminated food and water. In contrast, hepatitis B and C are acquired through an infected person's blood or other body fluids. Other risk factors are dialysis patients, men who have sex with men, and surgery (CDC, n.d). Vertical hepatitis B infection is contracted when the mother is pregnant, and the fetus is at risk of infection. Acute hepatitis is resolved within six months or progresses to chronic hepatitis, resulting in liver cirrhosis, liver cancer, or liver failure. The liver is a vital organ that processes nutrients, filters the blood, and fights infections. Symptoms of hepatitis include fever, loss of appetite, dark urine, nausea, vomiting, abdominal pain, and jaundice, where the skin is yellow (CDC, 2023). In standard clinical practice, a non-invasive assessment of the diagnosis of potential liver damage can be indirectly derived by measuring the blood levels of aspartate transaminase (AST) and alanine transaminase (ALT), enzymes known as the liver tests (Chicco & Jurman G, 2021).

Hepatitis B

Hepatitis B is a potentially life-threatening liver infection transmitted via body fluids, including blood, semen, and vaginal secretions (Tripathi & Mousa, 2022). Hepatitis B has been associated with 0.42 per 100,000 deaths in the United States in 2021 (CDC, 2021). Also, sudden death among persons with chronic hepatitis B has been associated with coinfection with HIV/AIDS, diabetes, metabolic syndrome, alcohol use disorder, and smoking (Ly et al., 2022). The WHO's goal is to eliminate 95% of HBV worldwide by 2030 (Philippa et al., 2021).

Transmission of hepatitis B virus (HBV) can be horizontal or vertical (Conner et al., 2023). Horizontal transmission involves the transmission of hepatitis B virus through sexual contact or mucosal surface contact. Unprotected sexual contact and injection drug use are significant modes of horizontal transmission of HBV in low to intermediate-prevalence areas. Vertical transmission is the predominant mode of HBV transmission that involves the maternal-to-newborn perinatal transmission of the infection. The three primary serologic markers used to determine HBV status

are hepatitis B surface antigen (HBsAg), antibody to hepatitis B surface antigen (anti-HBs), and antibody to hepatitis B core antigen (anti-HBc). Hepatitis B surface antigen indicates HBV infection in either an acute or chronic state. Anti-hepatitis B in immunocompetent persons that had never been infected with HBV, with a concentration of less than ten milli-international units per milliliter (10mIU/mL) within two months after completion of a Hepatitis B vaccine series, indicates immunity. Total anti-HBc is present in HBV-infected individuals and is resolved or typically persists in an individual for life. However, individuals whose immunity to HBV is from a vaccine do not develop anti-HBc. Other markers are hepatitis B deoxyribonucleic acid (HBV DNA), Hepatitis B e antigen (HBeAg), and antibodies to HBeAg (anti-HBe). Hepatitis B virus DNA measures the viral load in the body. Hepatitis B e antigen is a marker for viral replication and high infectivity; anti-HBe can monitor response to treatment and chronic HBV infection progression (Conner et al., 2023).

Antiviral treatment, monitoring, and liver cancer surveillance can reduce morbidity and mortality from HBV. Routine vaccination for hepatitis B is recommended at birth, and most infants should be vaccinated within 24 hours of life (Conner et al., 2023). A medically stable infant born to a hepatitis B surface antigen (HBsAg) negative mother weighing at least 2 kg (kg) should receive their first hepatitis B vaccination within 24 hours of birth. A medically unstable infant that weighs less than or equal to 2 kg will receive the hepatitis B vaccine once medically stable (Dugovich et al., 2023). If an infant weighs 2 kilograms at birth and has an HBsAg-negative mother, they should receive the vaccine at one month of age or hospital discharge. For an infant born to an HBsAg-positive mother, the hepatitis B vaccine and hepatitis B immunoglobulin are given within twelve hours of birth. For an infant with a mother with an unknown HBsAg status, the hepatitis B vaccine should be delivered within twelve hours. Furthermore, hepatitis B immunoglobulin should be returned within twelve hours if the infant is less than 2 kg or within seven days of birth if the infant weighs more than 2 kilograms. Based on this guidance, practically all infants should be vaccinated for hepatitis B within the first thirty days of their delivery or by discharge (Dugovich et al., 2023).

Hepatitis C

The World Health Organization (WHO) set a goal to reduce hepatitis C incidence by 90% and a 65% reduction in mortality by 2030 (Taha et al., 2023). Hepatitis C infection is commonly reported among injection drug users and increases incidence among persons aged 18 to 40.

However, hepatitis C is one of the under-reported diseases worldwide and can be curtailed by active follow-up and educating risk groups about the importance of testing. In addition, 3.26 to 5.0 million children and adolescents worldwide have chronic hepatitis C (Verma et al., 2022; CDC, June 2023).

Hepatitis C transmission occurs through exposure to blood from unsafe injection practices, unsafe health care such as instrument sterilization, unscreened blood transfusions, injection drug use, and sexual practices that lead to exposure to blood (WHO, 2023). Hepatitis C-associated deaths are 3.45 per 100,000 people in the United States in 2021 (CDC, 2021).

Centers for Disease Control and Prevention (CDC) recommends that primary care providers should screen all patients 18 years and older at least once in their lifetime for hepatitis C. Routine periodic testing is also recommended for all adults. Patients with recognized exposures, such as the use of injection drugs, should be tested for hepatitis C regardless of age or prevalence, and regular periodic testing should continue when risk persists (CDC, 2021). However, there is no vaccine for hepatitis C infection prevention. People who tested negative for hepatitis and those who are continually exposed require periodic antibody testing. Patients with positive antibody tests should undergo the polymerase chain reaction (PCR) test with the same blood sample, thus eliminating incomplete tests and strategies that use multiple visits for testing. Polymerase chain reaction detects genetic material from a pathogen or abnormal cell sample; the test is a technique to make many copies of a specific DNA region in a test tube rather than an organism. The test has shown benefits in linking to care and is cost-effective for mass screening, meaning a quick, accurate diagnostic test for the early signs of an infectious disease (Calleja et al., 2022; Verma et al., 2022).

According to Thompson et al., 2022, hepatitis C treatment with direct-acting antiviral (DAA) agents is recommended for all persons with hepatitis infection, including adults, adolescents, and children below three years of age with chronic hepatitis C. The discovery of sofosbuvir, a second-generational treatment for hepatitis C, was a breakthrough in the advent of all-oral DAAs. Currently, glecaprevir/pibrentasvir (Mavyret) is a direct-acting antiviral drug prescribed to individuals infected with HCV (Verma et al., 2022). The duration of treatment with DAAs for hepatitis infection is twelve to twenty-four weeks, depending on the absence or presence of cirrhosis (WHO, June 2022).

Tuberculosis

The WHO defines Tuberculosis (TB) as an infectious disease that most often affects the lungs and is caused by *Mycobacterium tuberculosis*, a species of pathogenic bacteria in the family of Mycobacteriaceae. The bacteria are transmitted when an infected person coughs, sneezes, or spits, and a healthy individual inhales the bacteria. Tuberculosis may be symptomatic, including weakness, weight loss, fever, loss of appetite, chills, night sweats, pain in the chest, or coughing up blood. Tuberculosis risk factors can be divided into four: proximity, age, immunity, and environment. Proximity in terms of close contact with an infected individual can enhance TB transmission. For example, the healthcare workers caring for an infected individual are at greater risk. Also, children less than five years old and individuals with weakened immunity due to other diseases such as HIV, diabetes, and silicosis are at risk of contracting TB. In addition, persons who have immigrated from areas of the world with high rates of TB are also at risk (CDC, March 2016).

Active TB is a disease that occurs when bacteria multiply in the body and are unresponsive to the immune system. The active TB incidence rate in the United States in 2022 was reported to be 2.5 per 100,000 (Schildknecht et al., 2022). According to the CDC, latent tuberculosis infection (LTBI) is an infection with *Mycobacterium tuberculosis* in which the bacteria are alive but contained by the immune system. People with LTBI have no symptoms, do not feel sick, and cannot spread tuberculosis to other people (WHO, April 2023).

Tuberculosis remains an essential infectious preventable disease worldwide, while LTBI can progress to active disease if left untreated. The latent tuberculosis infection incidence rate in the United States in 2022 was reported to be 5.0% (13 million individuals) (Mangione et al., 2023). Rates of progression may be higher in persons with certain risk factors or medical conditions. The WHO has set targets to eliminate tuberculosis as a public health problem globally by 2035. The targets for 2030 are a 90% reduction in TB deaths and an 80% reduction in the TB incidence rate (WHO, SDG, 2023). The WHO recommends early identification of TB treatment and targeted treatment of LTBI among individuals with the highest risk of progression, such as recently exposed individuals, young children, and immunocompromised individuals, to control global TB incidence (Mangione et al., 2023).

According to the research carried out by the US Preventive Services Task Force in 2023, two screening tests for LTBI are currently available in the US: the tuberculin skin test (TST) and interferon-gamma release assay (IGRA). The TST requires trained personnel to administer

intra-dermal purified protein derivative (Mantoux test), a substance from mycobacterium tuberculosis, and interpret the response 48 to 72 hours later. Testing with the IGRA prevent false positive result in an individual who has received a Bacillus Calmette Guerin (BCG) vaccination compared to the TST. The BCG is a live attenuated vaccine primarily used against tuberculosis. The IGRA requires a single venous blood sample that measures the immune response to specific *Mycobacterium tuberculosis* antigens and laboratory processing within eight to thirty hours after collection ((Mangione et al.,2023).

Some of the challenges with TB are following up for screening and further medical evaluation, not starting treatment, and needing to complete treatment if started on therapy: treatment accessibility, logistics, duration of treatment, treatment adverse effects, financial constraints, and communication barriers. Health information literacy focuses on interactive communication between patients and health professionals. Health information literacy is one of the major determinants of TB patients' health outcomes, which assists families, patients, and the public with information to discuss health issues with medical professionals or seek out treatment (Olayemi, 2022). One of the communication challenges was to determine how TB patients perceive information. Research conducted among parents and school staff in Italy measured the impact of communication implementation during the TB outbreak. The outcome stated that the implemented communication initiatives that involve face-to-face interaction were less effective in individuals with a lower education level (Gentili D. et al., 2020).

During the project, many hepatitis patients were unable to be contacted via phone call or awareness letter due to individual attitudes and missing personal information such as the phone number and house address. I worked with the public health officer to create media awareness on tuberculosis and hepatitis infection for Wyandotte County residents.

Chapter-2 Learning Objectives and Project Description

The learning objectives are:

1. To establish the infection rate of hepatitis B and C in Wyandotte County between April 12, 2023, and July 28, 2023, based on the data of confirmed hepatitis B and C cases of the period above.
2. To enhance the understanding of all active TB patients with low literacy in Wyandotte County through visual posters of nutritional guides and TB preventive strategies throughout their anti-TB treatment period.
3. To inform Wyandotte County residents on hepatitis and TB tests by collaborating with the public information officer to educate through TB flyers, Instagram, and Facebook by July 28, 2023.
4. To develop a customized nutritional guide to optimize anti-TB treatments in the Wyandotte County Public Health Department.

To establish the infection rate of hepatitis B and C in Wyandotte County between April 12, 2023, and July 28, 2023, based on the data of confirmed hepatitis B and C cases of the period above.

I was responsible for the disease investigation of confirmed adult hepatitis C cases at the health department from April 12, 2023, to July 28, 2023. The expectation was to ensure that all patients who tested “probable” had a confirmatory test, and every confirmed case was encouraged to follow up with the provider for treatment.

I asked the patients for basic information such as signs and symptoms of hepatitis, dental history, surgery, organ transplant, sexual contacts, tattoos, and body piercing. I also called the provider about laboratory results, specifically the liver enzymes, ALT, and AST (blood tests most frequently used for liver diseases). Aspartate aminotransferase and ALT are enzymes (proteins that help speed up chemical reactions in the body) found mainly in the liver and other tissues, such as muscles, and are part of the normal metabolic processes in the liver and are responsible for transferring amino acids (components that build proteins) from one molecule to another. The data received from the patients and providers were entered in EpiTrax.

EpiTrax is a surveillance and outbreak management system that allows local, state, and federal agencies to identify and investigate infectious diseases, environmental hazards, and

bioterrorism threats. EpiTrax also supports electronic laboratory reporting and offers advanced analysis, visualization, and contact and case information reporting. In addition, it increases overall effectiveness in preventing morbidity and mortality through decreased reporting time, automated assignment and routing processes, easy form-creation tools, trend analysis, avoiding errors, and quality assurance (KDHE, 2019).

Hepatitis B investigation depends on the instruction received from the Kansas Department of Health and Environment (KDHE) to follow up on infants and pregnant women. The hepatitis B instruction from the Epidemiologist and perinatal hepatitis B prevention program (PHBPP) coordinator at KDHE, Sarah Chicchelly, ensures the infant receives a complete hepatitis B vaccination. Also, immunoglobulin (IgG) post-exposure prophylaxis (PEP) was given to the infant after birth, and to verify if the provider did proper testing, HBsAg. For example, the hepatitis B surface antigen test (HBsAg) is the golden standard, measuring HBV-specific antigens and antibodies (see Table 3.1).

To enhance the understanding of all active TB patients with low literacy in Wyandotte County through visual posters of nutritional guides and TB preventive strategies throughout their anti-TB treatment period

The TB case manager, Megan Harrigan, estimated that more than 50% of the active TB patients are immigrants with low literacy and, as a result, cannot understand basic health instruction when it is written (Sufianu T., personal communication, April 25, 2023). However, patients are expected to adhere to anti-TB medication and health education throughout six to twelve months of treatment. Research conducted on screening immigrants for TB in Sweden stated that seventy percent of individuals in an interview requested TB information in their mother tongues. Consequently, language and literacy are substantial barriers to appropriate access and provision of healthcare services to immigrants (Nkulu et al., 2010). Low knowledge of tuberculosis with inadequate health information literacy can lead to poorer treatment outcomes (Olayemi, 2022).

To address TB patients' inability to understand basic written instructions, I initiated the food packet posters, mainly diagrams, indicating the appropriate food for TB patients while on treatment (see APE report, appendix 3). Also, another poster with a diagram of different methods of TB prevention, such as opening windows, mask usage, the appropriate way of covering the mouth when coughing, and the use of medication promptly, as incorrect dosage can result in TB

drug resistance (see APE report, appendix 2). In addition, the basic TB information on the flyer would be translated into individual patients' language —the TB flyers were printed and included in the packet given to the TB patients at the beginning of treatment (see APE report, appendix 1). **To inform Wyandotte County residents on hepatitis and TB tests by collaborating with the public information officer to educate through TB flyers, Instagram, and Facebook by July 28, 2023**

To achieve control and TB prevention targets in 2035, people must be conscious of TB infection and take proper precautions. One of my responsibilities was to change the structure of the TB waiting room to reflect current information on the posters pasted on the wall. The old posters on the wall were removed and replaced with new posters, ordered from the Center for Disease Prevention and Control (CDC) by the Chief Epidemiologist, Elizabeth Groenweghe (see Figures 2.1 and 2.2). The TB doctors and nurses frequently see patients in the waiting room for general body checks, blood draws, injections, and monthly health clinics. For safety precautions, I cleaned the waiting room. I restructured the nurse's sitting position to be directly in the sun's rays, compared to the former arrangement in which the nurses and patients were positioned in a cool corner within the TB room (see Figure 2.2). *Mycobacterium tuberculosis* cannot survive in the sun compared to a humid and dark environment. The bacteria stop growing at 80°C, die after 1.5 hours at 42°C, and after 10 minutes under ultraviolet (UV) exposure (Vinmec, n.d). However, I did not have measuring equipment to verify the temperature parameters of the TB waiting room.

Figure 2.1 Old TB Waiting Rooms 1 and 2

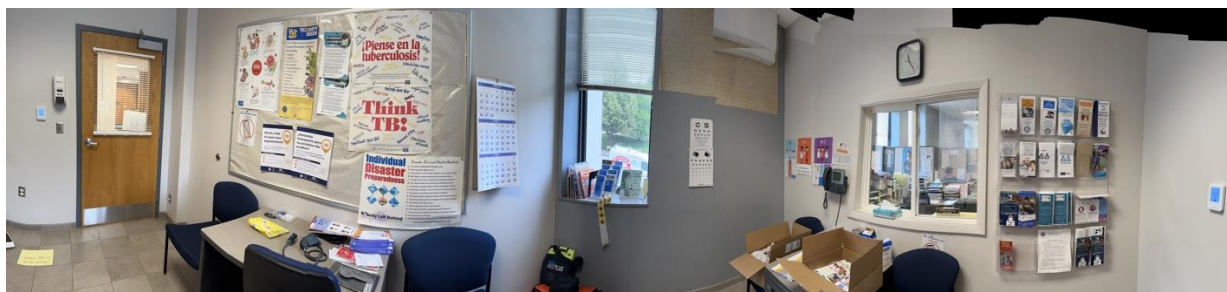
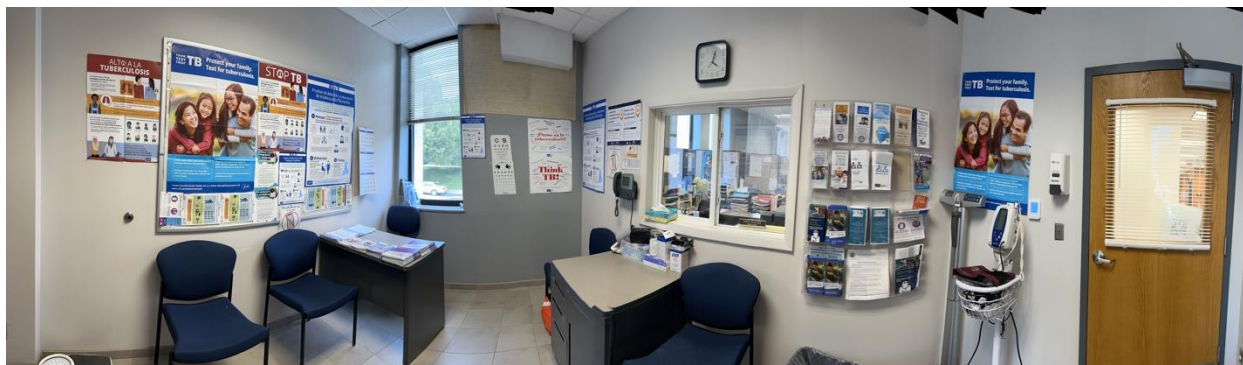


Figure 2.2 New TB Waiting Rooms 1 and 2



(Sufianu. T. (2023). *Tuberculosis waiting room* (Photography). Wyandotte County Public Health Department).

Furthermore, the TB flyers (see APE report, appendix 1) were designed and provided to the people during the outreach program for TB testing. The flyers were also positioned on the table in the health department reception so anyone could access TB information. The TB flyers were also available at the health department clinics.

To develop a customized nutritional guide to optimize anti-TB treatments in the Wyandotte County Public Health Department

The TB meeting is a forum where patients' issues are discussed. The meeting consists of the TB doctor, the chief epidemiologist, TB nurses, communicable disease support staff, and the deputy director for public health. As discussed in the meeting, the nurses reported a treatment success rate of no death among the TB patients; those who started anti-TB treatment in the second quarter of 2022 completed their treatment successfully in the first quarter of 2023. Thus, patients received gift cards and celebrations at the end of their six to twelve months of treatment.

Psychosocial issues, such as financial constraints, inappropriate food intake while on treatment, foster care, and transportation, were promptly addressed, ensuring no treatment interruption. At the meeting, it was confirmed that some TB patients eat unhealthy meals that weaken the immune system. Thus, it reduces the efficacy of the anti-TB treatment to eliminate TB infection in the body. Examples of poor nutrition are alcohol, sweetened carbonated beverages (soda), and processed foods (fried foods), which contain saturated fats and trans-fats and can worsen symptoms associated with TB (diarrhea, abdominal cramps, fatigue).

I decided to provide a food poster as a guide, indicating the type of food that should be eaten while on anti-TB treatment (see APE report, appendix 3). A pictorial diagram of different classes of food was pasted on the poster, such as protein (meat, fish, eggs, beans, nuts, seeds), fruits (banana, avocado, strawberry), vegetables (broccoli), grains, dairy (milk, yogurt), and drinking plenty of water. The metabolic process of TB medications such as Rifampin and Isoniazid occurs in the liver and is excreted in the urine; five to six liters of water daily will eliminate the toxic waste of anti-TB medication from the body (Tata 1mg, 2017). Also, I added a diagram to avoid alcohol intake as it reduces the effectiveness of the anti-TB treatment in the body. A weakened immune system increases the risk for infection, and consequently, liver damage, which is one of the side effects of anti-TB treatments. A healthy liver metabolizes drugs, while an impaired liver leads to drug toxicity in the body due to elevated drug serum levels (WHO, 2013; Annabel, 2022).

Chapter-3 Results

My project was based on disease investigation of hepatitis B and C patients and tuberculosis awareness. My supervisor, the chief epidemiologist, Elizabeth Groenweghe, assigned the hepatitis C cases. At the same time, I received instructions for perinatal hepatitis B from Sarah Chicchelly, an Epidemiologist and perinatal hepatitis B prevention program (PHBPP) coordinator at KDHE (see Table 3.1).

Hepatitis B

Table 3.1 Investigation Instructions

- To follow up on initial hepatitis vaccination, post-vaccination serologic testing (PVST)
- Educate and encourage parents on immunization.
- Contact the provider for a hepatitis confirmatory test and schedule.

The tables below show the number, age, and gender of hepatitis B patients whose parents and providers were followed up with questions via phone (see Table 3.2).

Table 3.2 Hepatitis B Patients Investigation 12th April 2023-July31st, 2023

| Number of clients (#) | Client age (months) | Client gender |
|-----------------------|---------------------|---------------|
| 8 | 0-24 months | Female |
| 6 | 0-24 months | Male |

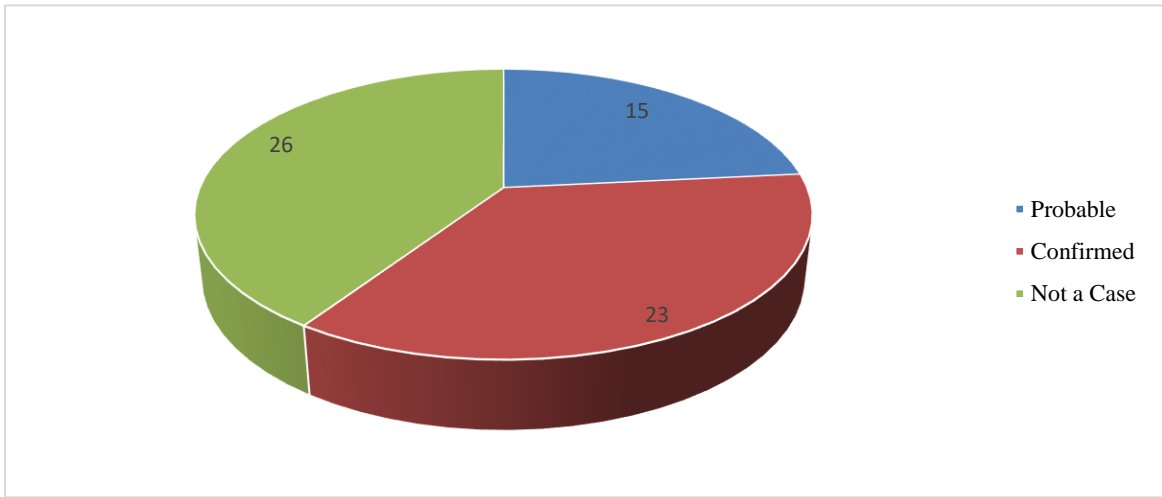
Hepatitis C

From April 12, 2023, to July 31, 2023 (Sufianu, 2023), investigations show HCV infects adults (97%) compared to children (3%) in Wyandotte County in Kansas State. I analyzed hepatitis C data using case status, gender, age, race, ethnicity, and outcome. The case status is the patient's hepatitis C results that tested probable, positive, and negative. Probable means there is a need for

a confirmatory test, that is, viral load testing. Positive status indicates an individual needs medical intervention, and patients who tested negative do not need any follow-up.

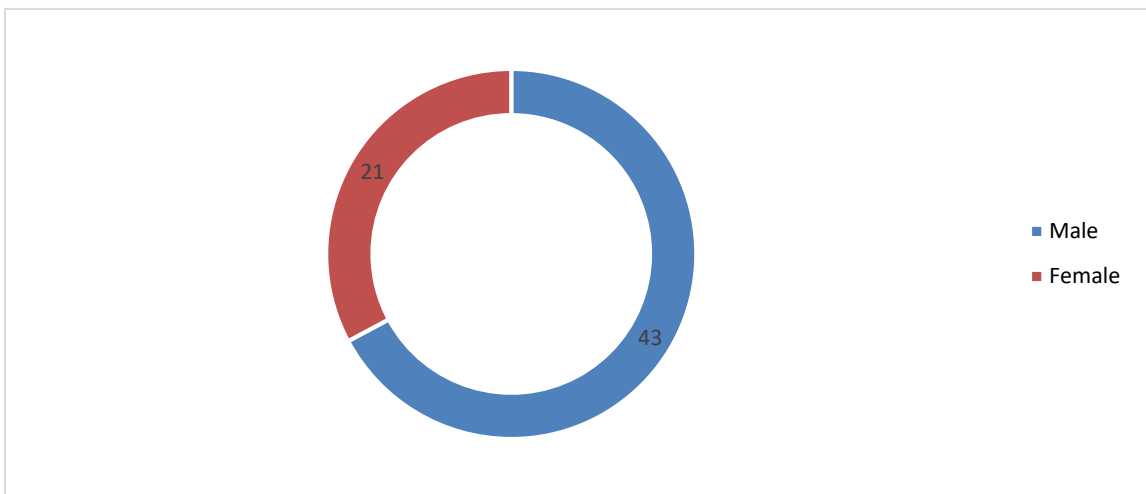
The case status of hepatitis C patients between April 12, 2023, to July 28, 2023, showed that 23% were probable, 35% positive, and 39% negative in Wyandotte County, Kansas (see Figure 3.1).

Figure 3.1 Case Status of Hepatitis C Patients



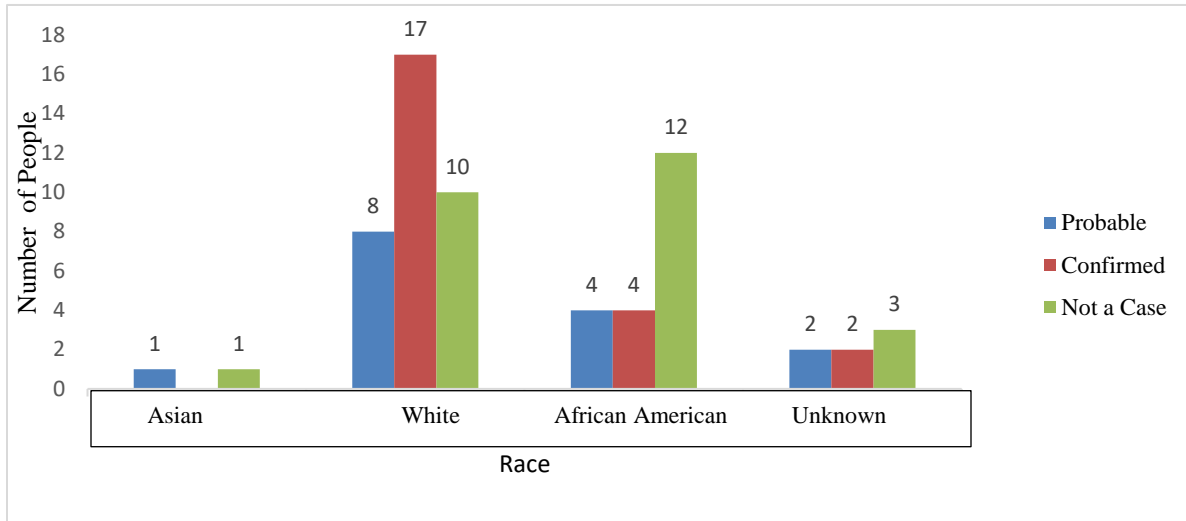
In this report, males (65%) are more infected than females (32%) in Wyandotte County, Kansas, between April 12, 2023, and July 28, 2023 (see Figure 3.2)

Figure 3.2 Gender of Hepatitis C Patients



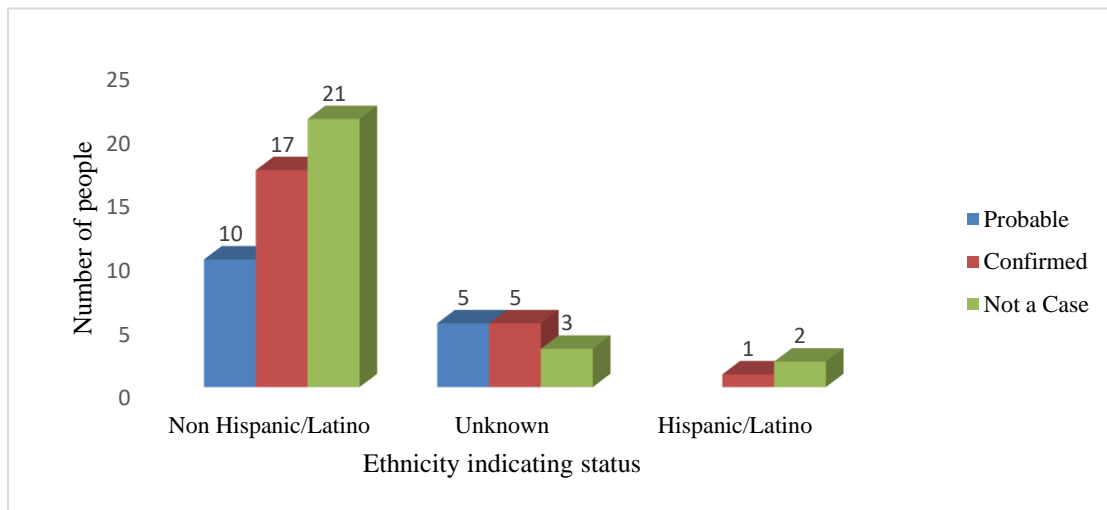
Hepatitis infection reports between April 12, 2023, and July 28, 2023, were higher among whites (25%), followed by African Americans (18%) and Asians (0%) with no positive case, while 3% remains unknown in Wyandotte County, Kansas (see Figure 3.3).

Figure 3.3 Race of Hepatitis C Patients



In the period of my project, the investigated cases in terms of ethnicity (probable, confirmed, and negative) were 72% non-Hispanic or Latino and 5% Hispanic or Latino, while 20% were unknown because the ethnicity was not documented (see Figure 3.4).

Figure 3.4 Ethnicity Indicating Case Status of Hepatitis C Patients



The outcome of the hepatitis C cases investigated in Wyandotte County, Kansas, can be favorable or unfavorable. 20% completed the investigation, 26% were lost to follow-up, 38% had no analysis, 9% declined, and 5% were unable to locate (see Figures 3.5 and 3.6).

Figure 3.5 Outcome of Investigated Hepatitis C Patients

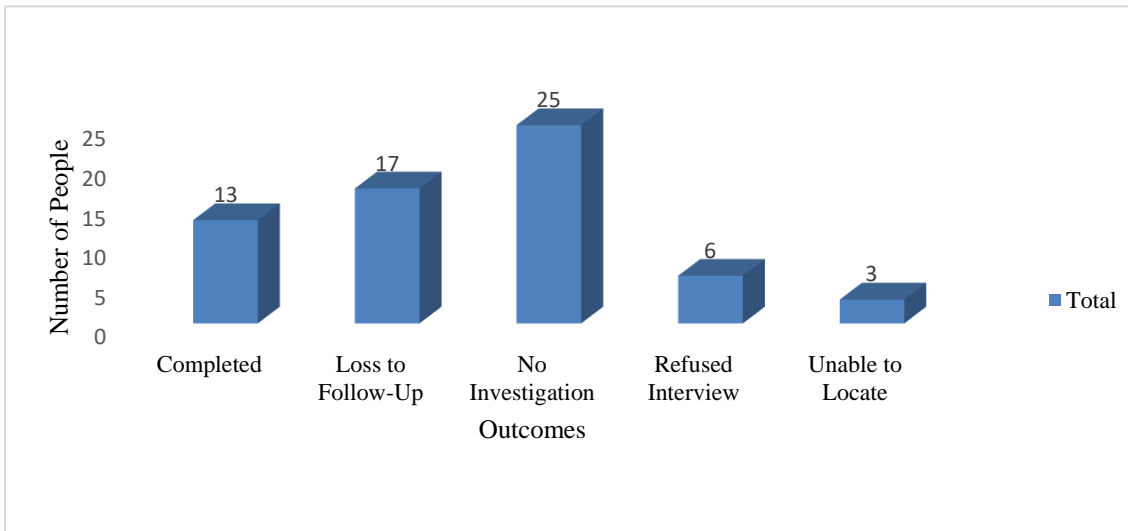
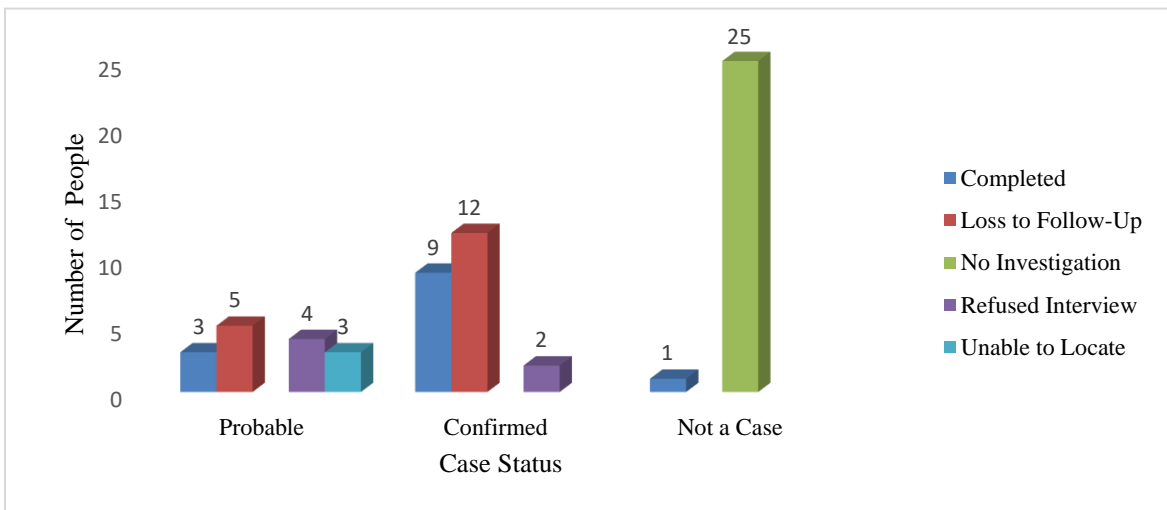


Figure 3.6 Case Status and Outcome of Hepatitis C Patients

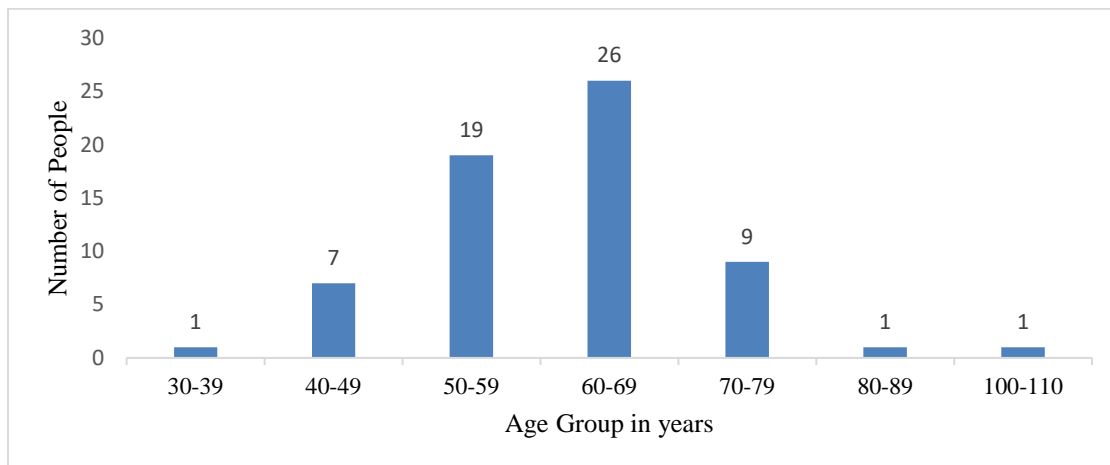


The intervention provided for hepatitis C missed cases was first to draft an awareness letter that was sent to an infected individual’s home address as indicated on EpiTrax. However, this one-

time intervention response was low. The letter stated to whom it may concern and a need to call or visit the health department Monday through Friday for important information. I sent twenty copies of letters, which only three responded. The following intervention was to collaborate with Janell Friesen, the Public Information Officer, on hepatitis B and C public awareness on the Instagram and Facebook accounts of the Wyandotte Public Health Department. The information would state the importance of hepatitis testing and timely intervention, including the recent KDHE guideline adjustment that all pregnant women and children must be tested for hepatitis C. In addition, all patients who want voluntary tests should have antibody tests, followed by PCR testing, to avoid incomplete tests.

The report from my project indicated that hepatitis C infection was common among ages 60-69-year-olds in Wyandotte County, Kansas, between April 12, 2023, and July 28, 2023 (see Figure 3.7).

Figure 3.7 Age Group of Hepatitis C Patients



The TB flyers were positioned strategically within the health department and can be distributed during the outreach programs for public awareness. The collaboration was with Janell Friesen to design flyers that reveal how TB can be transmitted from one person to another, four cardinal signs of tuberculosis, which are loss of weight, night sweat, coughing of blood/mucous, and fever—recommendation, and Wyandotte county health department information for voluntary testing (see APE report, appendix 1).

Communication is a challenge for the Chuukese community that resides in Wyandotte County, a barrier towards anti-TB treatment in an infected individual. A food poster packet showing a picture of the appropriate food while on TB medication, other essential information that

can be translated into the patient dialect through a translator, and a poster for the preventive measures were given to each patient in a packet at the beginning of anti-TB treatment. The preventive poster is a pictorial diagram of different strategies to reduce the spread of TB, such as mask usage, opening windows, and proper cough etiquette. The public information officer, Janell Friesen, assisted in perfecting this poster (see APE report, appendix 3).

Chapter 4-Discussion

The mission of the Wyandotte County Public Health Department is to prevent disease, promote wellness, and protect and improve the environment in Wyandotte County. My project has created awareness of TB testing, enhanced by the TB flyers and posters distributed during outreach and within the Wyandotte County Health Department.

I was able to carry out the perinatal hepatitis B investigation successfully based on the instruction given by PHBPP coordinator Sarah Chicchelly. There is minimal concern with perinatal hepatitis B patients because of the consistent linkage to care and follow-up. The outcome of the entire investigation on HCV shows a high percentage of a completed outcome, meaning a successful response from the patients via phone call. The report from the EpiTrax analyses reveals that HCV is common among males compared to females within the age group of 60-69 years. Also, HCV is common among white and non-Latinos.

During the evaluation process of the TB data with data informaticist Francis Asogwa, we calculated an accurate figure for TB testing in the health department. The first quarter result and the second quarter of 2023 were compared. The outcome indicated that the total number of people who voluntarily tested for tuberculosis in the second quarter doubled in the first quarter. Thus, evidence shows a positive impact of the intervention on TB awareness in Wyandotte County (see Table 4.1).

Table 4.1 Evaluation TB Testing in the 1st and 2nd Quarter, 2023

| YEAR OF TESTING | QUARTER (Q) | TOTAL NUMBER |
|------------------------|--------------------|---------------------|
| 2023 | Q1 | 64 |
| | Q2 | 138 |
| | Q3 (only July) | 28 |

The limitations encountered when investigating hepatitis cases include incomplete demographic data to contact the patient. The patients also declined interviews when they perceived

some questions as personal, such as the number of sexual partners. Two infants were tested for HCV with pending results; the results were not yet entered into the EpiTrax. However, some hepatitis C adult patients were already on treatment before contacting for result notification, while individuals with negative results ended with a case-completed outcome instead of having a further investigation of risk factors.

Further intervention is needed with HCV testing as data shows only sixty-one people tested within Wyandotte County from January 2023 to July 2023. The Wyandotte County acute and chronic hepatitis C data was last updated in 2019 and revealed 141 confirmed and probable cases of hepatitis C infection, meaning an average of 35 confirmed and probable cases were detected for each quarter in 2019. Compared with my project after a four-year report, I investigated 38 hepatitis C confirmed and probable cases in Wyandotte County between April 12, 2023, and July 28, 2023. However, I could not conclude if this is a true reflection of the current quarterly hepatitis C test results from Wyandotte County due to the absence of data for the past four years. As a result, I recommend that the Wyandotte County Public Health Department should compile hepatitis C data that reflect the current situation within the county. In addition, the health department public officer, Janell Friesen, should complete the media awareness of hepatitis C and possibly include the importance of TB testing on the Facebook and Instagram accounts.

To conclude, there is a need for continuous collaboration between the health sector and students from higher institutions to create awareness and encourage the public on TB and hepatitis testing. This will help to reduce transmission of HBV, HCV, TB and strengthen public health within Wyandotte County.

Chapter 5-Competencies

This chapter details how specific competencies were achieved in the overall field experience with the chief epidemiologist, Elizabeth Groenweghe (EpiTrax). This chapter first reviews overall MPH competencies numbers 4, 7, 9, 18, and 21, and then details how I achieved specific emphasis area (infectious diseases and zoonoses) competencies.

Competency #4: Interpret results of data analyses.

Competency 4 is a competency from evidence-based approaches to public health—the interpretation of results of data analysis for public health research, policy, or practices. This project was based on public health research. I learned how to collate and analyze data using spreadsheets to generate tables and graphs in the MPH 701 Fundamental of Biostatistics course. For this competency, data from hepatitis cases was collected from EpiTrax and analyzed using Microsoft Excel®—this involved categorizing information into numerical or categorical variables for statistical analyses. To assist in interpreting the results, the distribution and summary of measures of hepatitis B and C cases were represented in the form of tables, pie charts, and bar charts that were further detailed by the number of probable, confirmed, and negative case statuses.

Competency #7: To assess population needs, assets, and capacities that affect communities' health.

Competency 7 is a competency from planning and management to promote health—to assess population needs, assets, and capacities that affect communities' health. One of the core courses was MPH 802 Environmental Health, which reviewed how environmental factors, including infectious diseases, impact public health. Tuberculosis (TB) is an airborne disease transmitted when an infected person coughs, sneezes, talks, and sings, and a healthy person inhales the bacteria. At the TB clinical meetings, the chief epidemiologist and other public health officials determined that there was an increase in positive cases of TB, including an outbreak in the first quarter of 2022 (Wyandotte County Public Health Department. (2023, April 12- July 28). TB Clinical Meeting. Wyandotte County, Kansas). Therefore, during the TB testing outreach activities related to this project, I communicated with the Wyandotte County residents on how TB can be prevented as they departed from the testing center, I distributed flyers to the testers to disseminate the information after the TB test (see APE report, appendix 1). Also, I created posters for the active TB patients on treatment. The posters provided information on preventive measures to reduce TB transmission from the patients to their household members. I included on the poster the correct use

of masks, opening windows, timely medication use, and covering the mouth with clothes or flexed elbow when coughing (see APE report, appendix 2).

In addition, this competency was fulfilled when investigating hepatitis C cases, in which feedback from the community provided information about how to assess a population regarding a sexually transmitted disease. I discovered that 26% of individuals with probable and positive results in Wyandotte County could not be reached via phone call or awareness letter (see APE report, appendix 4). In addition, 9% of residents declined calls, because they believed the questions were private. For example, residents declined calls because they did not feel comfortable reporting the number of sexual contacts for the past six months. Also, 5% of residents could not be reached, because there was no contact information on their record. With this information and in the future, Public Information Officer, Janell Friesen, may be able to create more awareness of the importance of hepatitis C testing at the Wyandotte County Public Health Department using other methods of communication, including the use of Facebook and Instagram, to help broaden communication and decrease reluctance to divulge private information.

Competency #9: Design a population-based policy, program, project, or intervention.

Competency 9 is a competency from planning and management to promote health—design a population-based policy, program, project, or intervention. This competency was achieved through the course work MPH 754 Introduction to Epidemiology. My population-based intervention stems from attending the clinical meetings, noting the challenges, such as the language barrier, nutrition, and lifestyles of the TB patients, participating in outreach programs, and creating TB flyers and posters as a tool for population intervention.

I used the TB flyers (see APE report, appendix 1) as a tool for TB public health intervention, and printed flyers were given to each person who came to the TB test outreach event as they exited the testing venue (see APE report, appendix 1). To impact TB transmission within Wyandotte County through education and awareness, I explained to residents the effective reproductive number (R_E), which is the number of people in a population with whom an individual with TB can infect at any specific time. On the TB flyers, I indicated the possible number of people that TB can be transmitted to based on the information from WHO, which states that an infected individual can transmit TB disease on average to fifteen people annually (1:15).

A packet that contains a TB flyer, posters on preventive strategies, and a nutritional guide were given to each active TB patient at the beginning of their treatments. This will support an effective treatment prognosis through the six to twelve months of treatment.

Competency #18: Select communication strategies for different audiences and sectors.

Competency 18 is a competency from communication—select communication strategies for different audiences and sectors. The DMP 815 Multidisciplinary Thought and Presentation course taught me to emphasize concise information that is tailored to a specific group. Since the TB Nurse, Megan Harrigan, confirmed that 50% of TB patients treated within the Wyandotte County Public Health Department have low literacy (Sufianu T., personal communication, April 25, 2023). Therefore, I created a visual image to communicate information on the appropriate nutritional intake during the six to twelve months of anti-TB treatment. For example, I posted a pictorial diagram of different classes of food that should be eaten and would not interfere with anti-TB treatments (WHO, 2013; Annabel, 2022), such as protein-rich foods (meat, fish, eggs, beans, nuts, seeds), fruits (banana, avocado, strawberry), vegetables (broccoli), grains, dairy (cheese, milk, yogurt), and encouraging drinking of water (see APE report, appendix 3). In addition, avoiding drinking alcohol was also indicated. Alcohol is known to reduce the effectiveness of TB treatment in the body (WHO, 2013; Annabel, 2022).

Competency #21: Integrate perspectives from other sectors and/or professionals to promote and advance population health.

Competency 21 is a competency from interprofessional and/or intersectional practice—integrate perspectives from other sectors and/or professionals to promote and advance population health. The social and behavioral bases of public health from MPH 818 were crucial to my project. My supervisor, Elizabeth Groenghewe, assigned hepatitis C cases to me daily. I also received specific instruction on perinatal hepatitis B from Sarah Chicchelly, an epidemiologist and perinatal hepatitis B prevention program (PHBPP) coordinator at KDHE. I worked with the TB nurses at the Epi/TB department for basic information about the patient treatment prognoses and areas of challenge.

Also, attending weekly TB meetings with the individuals mentioned above and asking relevant questions enhanced my ability to meet organizational needs, such as developing impactful TB flyers. The information system analyst at the Wyandotte County Public Health Department, Francis Asogwa, provided the hepatitis C, B, and TB data for analysis and evaluation. Janell

Friesen, public information officer at the Wyandotte County Public Health Department, assisted with the perfection of the flyers and poster production in Canvas, an online graphic design platform. Interpersonal relationships with the outreach team exposed me to several environmental determinant factors, such as school systems and residence structure within Wyandotte County. As a result, I was able to tailor the information for the public awareness of hepatitis and TB effectively.

Table 5.1 Summary of MPH Foundational Competencies

| Number and Competency | | Description |
|------------------------------|--|---|
| 4 | Interpret results of data analyses. | The hepatitis C disease investigation results were graphically represented in bar charts, pie charts, flowcharts, and tables. From this, there was an indication that 26% were lost to follow up on the bar chart, for example. |
| 7 | Assess population needs, assets, and capacities that affect communities' health. | Posters indicating different preventive strategies for the spread of tuberculosis were designed. For example, using masks, appropriate methods of covering the mouth when coughing, opening windows, and timely use of anti-TB treatment. |
| 9 | Design a population-based policy, program, project, or intervention | TB flyers were used as a public intervention to enlighten people on how TB is spread. That is, through coughing, talking, sneezing, and singing. Also, the TB flyers encouraged individuals to take the initiative for testing. |
| 18 | Select communication strategies for different audiences and sectors | A visual poster diagram on appropriate nutrient intake (protein, vegetables, grains, fruits, and water) while on anti-TB treatment was created for the active TB patients. |
| 21 | Integrate perspectives from other sectors and/or professionals to promote and advance population health. | Collaboration with different departments for hepatitis and tuberculosis awareness was undertaken during this project. |

Student Attainment of MPH Emphasis Area Competencies

Competence 1: Pathogens/pathogenic mechanism

Competency number one is a pathogen/pathogenic mechanism—in zoonotic pathogens (AAI 795), human hepatitis viruses have an ancient zoonotic origin. The discovery of hepatitis C-related viruses in different animal species has raised new speculations regarding the origin of HCV. Non-primate hepaciviruses are like HCV, which has been described to infect horses, and infection passes on to human beings. (Pfaender, S. et al., 2015). I learned different mode of transmitting hepatitis viruses. The HBV and HCV are transmitted through contact routes, including reusing unsterilized needles (e.g., needle sharing among intravenous drug users), syringes, or other medical equipment; transfusion with blood not screened for HCV or transplantation of solid organs infected with HCV—hepatitis C virus is transmitted through sexual contact or perinatally (during childbirth). In addition, Infrequent modes of transmission include ear or body piercing, acupuncture, and tattooing, which can occur when inadequately sterilized equipment is used. The project investigation was based on the above risk factors to determine the extent of exposure.

Competence 2: Host response to pathogens/immunology

The second competency area is a host response to pathogens/ immunology—which was treated in the principle of Immunology (DMP 817). I learned that HBV and HCV are parenterally transmitted enveloped viruses that induce acute and chronic neuroinflammatory liver disease. The concept of the principle of immunology has enlightened me on the differences between HBV and HCV. Hepatitis B virus is a partially double-stranded deoxyribonucleic acid (DNA) virus and a member of the Hepadnaviridae family. In contrast, HCV is a positive-stranded ribonucleic acid (RNA) virus and constitutes a separate genus in the Flaviviridae family. During the hepatitis B investigation, I discovered that hepatitis B virus core antigen (HBcAg)-specific IgM is an early marker of disease and reflects an antigen in the body. As this relates to the project, I called the parents of infected infants via phone to discuss the immunological test results and recommended contacting the pediatrician for quick intervention. Similarly, calls to a health care facility, which includes the University of Kansas Hospital, Heartland Clinic, Advent Hospital, and Children's Mercy Hospital, to ensure that the provider carried out a confirmatory test, the HBV surface antigen (HBsAg).

Competence 3: Environmental/ecological influences

The third competency area is an environmental/ecological influence—introduction to One Health (DMP 710) states the ecological relationships between human, animal, and environmental health. I learned that tuberculosis can be acquired in the soil through farming activities—for example, fishing and animal rearing. Tuberculosis is also an airborne disease contracted when the bacteria is viable in the air, usually in a cool environment, and a healthy person breathes in the bacteria. I created a poster with a diagram of different preventive strategies, such as proper mask usage, opening windows for ventilation, and appropriate methods of covering the mouth, reducing the spread of infection (see APE report, appendix 2).

Competence 4: Disease surveillance

The fourth competency is disease surveillance—vaccinology (AAI 852), which is the science of developing vaccines to prevent infectious diseases, the use of vaccines, and their effects on the public. The principle of vaccinology enlightened me on different types of vaccines and general controversy regarding people’s opinions on vaccination. I learned that the hepatitis B vaccine is a suspension for intramuscular injections. During my project, I emphasized the four doses of the hepatitis B vaccine when I contacted mothers and providers via phone. I ensure that each infant is scheduled for vaccination at an appropriate time. Data related to hepatitis tests, vaccination exposure, signs, and symptoms were collected from the patients, nurses, and providers. Information received was entered in the EpiTrax. EpiTrax is an electronic disease surveillance system used by the Kansas Department of Health and Environment (KDHE). EpiTrax enhances electronic laboratory reporting and provides analyses, visualization, and reporting contact information—decreased reporting time anomaly detection. The project evaluation shows that HCV infection was higher in males than females and higher in Whites than African Americans and Asians. The non-Hispanic or Latino were more infected with HCV compared to the Hispanic or Latino. Thus, I can conclude that within the duration of my project, men were more at risk of hepatitis C infection than women within Wyandotte County between April 12, 2023, and July 28, 2023.

Competence 5: Disease vectors

The fifth competency area is a disease vector—zoonotic pathogen is a related course I can associate with the disease vector; however, my project is unrelated to any vector, such as mosquitoes and ticks. To investigate the role of vectors in infectious diseases, hepatitis B and C

viruses specifically target the liver, efficiently infecting inactive hepatocytes. Thus, I learned that the human hepatitis virus can be converted into vectors for liver-directed gene transfer.

Table 5.2 Summary of MPH Emphasis Area Competencies

| MPH Emphasis Area: | | |
|------------------------------|---------------------------------------|---|
| Number and Competency | | Description |
| 1 | Pathogen/pathogenic mechanism | Evaluate modes of disease causation of infectious agents. |
| 2 | Host response to pathogens/immunology | Investigate the host immune response to infection. |
| 3 | Environment/Ecological Influences | Examine the influence of environmental and ecological forces on infectious diseases. |
| 4 | Disease surveillance | Analyze disease risk factors and select appropriate surveillance. |
| 5 | Disease Vector | Investigate the role of vectors, toxic plants, and other toxins in infectious diseases. |

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